

# GREAT LAKES PROGRAMS AND PROBLEMS

*Statements presented to the  
Great Lakes Commission  
at the Annual Meeting  
November 12-13, 1956*

GREAT LAKES COMMISSION  
RACKHAM BUILDING  
ANN ARBOR, MICHIGAN



## PREFACE

The Great Lakes Commission at its annual meeting on November 12-13, 1956 received statements on Great Lakes programs and problems from Federal and other agencies active in the development and use of the water resources of the Great Lakes.

Sessions during the first day of the meeting were devoted to reports from Federal agencies and joint U. S. and Canadian agencies carrying on Federal and international programs in the Great Lakes Basin. Reports were received on behalf of the International Joint Commission, Great Lakes Fishery Commission, U. S. Corps of Engineers, U. S. Public Health Service, St. Lawrence Seaway Development Corporation, U. S. Maritime Administration and Federal Power Commission.

A session on the second day heard reports from other organizations and agencies with special interests in the development, use and conservation of the Basin's water resources. These included the Great Lakes Harbors Association, Lake Carriers' Association, Metropolitan Sanitary District of Greater Chicago, Great Lakes Overseas Freight Conferences, Great Lakes Research Institute, and Lake Erie Watershed Conservation Foundation.

The importance of the water resources of the Great Lakes to the economy and life of the people of the region and the nation needs no emphasis. The reports presented to the Great Lakes Commission contain much valuable and important information on current programs and plans for further developing these water resources and important statements of views on lake questions and problems. As a joint agency of the Great Lakes states, the Great Lakes Commission is publishing these reports as a service to public officials at all levels of government and to others concerned with the development and use of the valuable water resources of the Great Lakes.

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## TABLE OF CONTENTS

	<u>Page</u>
U. S. Corps of Engineers and International Joint Commission: Programs and Activities in the Great Lakes Area .....	1
U. S. Public Health Service: Progress Report on Water Supply and Water Pollution in the Great Lakes Area .....	11
Great Lakes Fishery Commission: Role of the Commission in the Solution of Fishery Problems .....	14
St. Lawrence Seaway Development Corporation: Progress in the St. Lawrence Sea- way Project .....	17
Federal Maritime Board and U. S. Maritime Administration: Developments Relating to the Great Lakes - St. Lawrence Seaway Area .....	19
Federal Power Commission: Hydroelectric Power in the Great Lakes - St. Lawrence Basin .....	22
Great Lakes Harbors Association: Its Development and Activities .....	29
Lake Carriers' Association: Objectives and Programs .....	32
Metropolitan Sanitary District of Greater Chicago: Additional Diversion of Water from Lake Michigan .....	35
Lake Erie Watershed Conservation Foundation: Proposals for Use of Lake Erie Water .....	41
Great Lakes Overseas Freight Conferences: Great Lakes Overseas Transportation Development .....	43
Great Lakes Research Institute: Organization, Objectives and Program .....	47





**U. S. CORPS OF ENGINEERS  
AND INTERNATIONAL JOINT COMMISSION:  
PROGRAMS AND ACTIVITIES IN THE GREAT LAKES AREA**

by Brigadier General P. D. Berrigan  
Division Engineer, North Central Division

It is indeed a pleasure to meet with the Great Lakes Compact Commission and to indicate the activities in the Great Lakes area in development of water resources by the Corps of Engineers, U. S. Army. Further, I have been asked by the Honorable Len Jordan, Chairman of the United States Section of the International Joint Commission, to summarize activities of that Commission with respect to the international boundary waters on the Great Lakes.

My remarks pertain, first, to the water resource investigations and construction work of the Corps of Engineers in the Great Lakes area and, second, to the activities of the International Joint Commission.

## PART I

### WATER RESOURCES ACTIVITIES IN THE GREAT LAKES AREA BY THE CORPS OF ENGINEERS

#### Introductory

The Corps of Engineers has responsibility for navigation, flood control, beach erosion control and related matters in the Great Lakes area. Congress has directed the Corps to undertake preliminary examination and survey reports to study these water resources. The survey program is a major phase of the work of the North Central Division. Construction of authorized projects is also a phase of our work in which you are interested. In addition to investigations which are actively under way, there are also studies which have been authorized by Congress but which have not yet been undertaken and projects which have been recommended for authorization in recently completed survey reports and which have not yet been authorized for construction by Congress. There is also a large backlog of projects authorized by Congress for construction and for which the necessary funds have not yet been appropriated. I will endeavor to present a summary of these related water resources activities in my statement.

#### Survey Report on Levels of the Great Lakes

The flood control investigation program which is actively under way in the Great Lakes basin

includes the important survey of the Water Levels of the Great Lakes. This lake level survey report was authorized by Congress in 1952. Our regulation studies leading to a determination of the feasibility of regulating the levels of the Great Lakes in the interest of shore property, navigation and power are proceeding with a target date for completion of 30 June 1957. Regulation studies on Lake Superior and Lakes Michigan-Huron have been completed. Lake Erie studies are progressing to such stage that testing of the regulation plan with respect to Lake Ontario levels under operation of the St. Lawrence power projects will soon be under way. Evaluation of the justification for regulation of the levels of the Great Lakes is proceeding concurrently with the regulation studies. As these studies near completion the results will be discussed with the representatives of the Governors of the Great Lakes States prior to preparation of the final report for submission to the Chief of Engineers.

An interim survey report was submitted in December 1952, recommending local flood protection projects for three localities on the westerly end of Lake Erie at Detroit Beach, Michigan; Lakewood-Luna Pier, Michigan; and Point Place, Toledo, Ohio. This report was published as House Document 424, 83rd Congress, 2nd Session. No action has been taken by Congress on this recommendation pending clarification by the Congress as to expansion of present flood control laws to include flooding aggravated by or due to wind or tidal effects. No further action will be taken with respect to study of other lake shore areas subject to flooding pending clarification by Congress of the flood control laws. The construction of the authorized flood control project on the shore of the west end of Lake Erie at the Reno Beach-Howard Farms area in Ohio is also held up pending the clarification of flood control legislation and appropriation of necessary funds.

The President's veto on 9 August 1956 of the bill to permit a three-year temporary increase of diversion from Lake Michigan at Chicago has resulted in instructions from higher authority to prepare an interim report to our Great Lakes Water Levels study which will pertain only to the Chicago diversion aspect of the lake level problem. This report will be similar to the report, dated 14 June, 1955, and entitled "Effect on Lake Ontario Levels of an Increase of 1,000 cfs in the Diversion at

Chicago for a Period of 3 Years," as prepared by the International Lake Ontario Board of Engineers for the International Joint Commission. The purpose of the study is to determine the effects on lake levels and outflows, and the evaluation of such effects with respect to navigation, power and shore property, of a 3-year temporary increase as well as a permanent increase of 1,000 cfs, in diversion at Chicago. This study is now well along. A meeting has been tentatively scheduled for 13 December 1956 in Chicago to discuss with the representatives of the Governors of the Great Lakes States the study findings prior to submission of the report to higher authority in January 1957. Members of the Great Lakes Commission have also been invited to attend this meeting.

#### Other Flood Control Studies

Flood control survey studies which are actively under way in the Great Lakes basin include the following:

- a. Sturgeon River basin in Upper Michigan. This study is being initiated this fiscal year.
- b. Grand River basin in Michigan draining into Lake Michigan. This comprehensive study of flood control and drainage problems will take 3 or 4 years to complete and is well under way this fiscal year.
- c. Maumee River basin, Indiana and Ohio. This comprehensive study includes consideration of local flood protection projects for urban areas and improvements in the interest of major drainage and agricultural flood control. This study has an estimated total cost of about \$400,000 and requires about 3 more years to complete. Interim reports are proposed to permit consideration of separate flood control problems in this basin.
- d. Rouge River, Michigan. A study is being initiated here this fiscal year to consider the flood control and drainage problems in the vicinity of suburbs of Detroit.
- e. Lackawanna, New York. This urban area has a serious flood problems resulting from overflow of Smokes Creek and this study is scheduled for completion this year.

In addition to the above specific reports there are a total of about 14 other flood control studies in the Great Lakes basin with an estimated cost of about \$337,000 and which will be undertaken when necessary funds therefor are appropriated.

#### Comprehensive Great Lakes Harbors Navigation Report

The most important navigation survey under

way in the North Central Division is the Great Lakes Harbors study. This study is a companion investigation to the program now under way for construction of the deepening project for the Great Lakes Connecting Channels and the St. Lawrence Seaway.

There were sponsored by Senator Charles E. Potter of Michigan and by Representative John A. Blatnik of Minnesota resolutions which were adopted on 18 May 1956 and 27 June 1956 by the Public Works Committees of the Senate and of the House of Representatives, requesting of the Corps of Engineers to determine the advisability of further improvements of harbors on the Great Lakes in the interests of present and prospective deep-draft commerce. In undertaking this survey study, the Congressional Committees requested that due regard be given to the scheduled time of completion of the St. Lawrence Seaway and of the presently authorized deepening of the Connecting Channels between the Great Lakes. The Great Lakes Harbors study was assigned to the Division Engineer, North Central Division, on 6 June 1956. In keeping with the policy of the Corps of Engineers to coordinate closely all water resource studies with local interests and to afford all interested parties full opportunity to present their views in support of any desired improvements on the entire United States coast of the Great Lakes, a series of public hearings is being scheduled at various localities along the shores of all of the Great Lakes. The initial hearing was held in Detroit on 16 October. The schedule for the public hearings subsequent to this Detroit hearing on the comprehensive Great Lakes Harbors report is now about finalized. The details as to time and place for each of the public hearings, including information as to the harbor or harbors to be considered at each hearing, are set forth in separate public notices which are being issued by the District Engineer of the district in which the hearing will be held.

The present estimate of the total cost of the Great Lakes Harbors Survey Report is about \$750,000. An initial amount of \$160,000 has been allotted for the current fiscal year. An initial phase of the Great Lakes Harbors study is undertaking a comprehensive traffic analysis of commerce entering or leaving the Great Lakes through the St. Lawrence Seaway. This phase of the study is under way. Determination of prospective commerce in bulk commodities, including iron ore, stone, grain and coal, are also under way and will be the basis for the prospective transportation savings resulting from harbor deepening. The problem to be considered will be the advisability of the United States participating in the cost of deepening harbors on the Great Lakes in order to take advantage of deepening of the Great Lakes Connecting Channels from the present depth of 21 and 25 feet in the upbound and downbound channels, respectively, to a controlling depth of 27 feet in both the upbound and downbound channels and of construction of the St. Lawrence Seaway.

Certain harbors on the Great Lakes will warrant deepening based on anticipated transportation savings to iron ore and other bulk commodities. The necessary studies and report on such harbors will not be delayed pending completion of the St. Lawrence Seaway general cargo traffic analysis. Appropriate interim reports as required will be submitted on individual harbors. While the over-all responsibility for preparation of the Great Lakes Harbors report has been assigned to the Division Engineer, responsibility for undertaking the individual harbor survey studies has been delegated by the Division Engineer to the District Engineers concerned.

There are certain outstanding review reports on individual harbors which are presently authorized and under way. Such individual harbor review reports dealing with consideration of depths advisable in the interest of present and prospective commerce in view of the Great Lakes Connecting Channels deepening and St. Lawrence Seaway work have now been combined with the comprehensive Great Lakes Harbors survey report.

#### Other Deep-draft Navigation Reports

In addition to the Great Lakes Harbors survey report there are under way at this time several separate survey studies to consider improvements at deep-draft harbors. Such separate studies include the following:

- a. Duluth-Superior Harbor, Minnesota and Wisconsin. To consider modification of the breakwater system at the Superior Entry and additional improvements in the inner portion of the harbor. A model study is now under way at our Vicksburg Experimental Laboratory to aid in the survey investigation of this important harbor. It is anticipated that two more years will be required to complete this survey report.
- b. Sturgeon Bay and Lake Michigan Ship Canal, Wisconsin. To consider facilities for local deep-draft traffic.
- c. Conneaut Harbor, Ohio. To consider the advisability of modification of the breakwater system. A model study is under way in connection with this survey.
- d. Lorain Harbor, Ohio. To consider modification of the breakwaters.

In addition to the above specific deep-draft harbor surveys, there are about 14 studies on the Great Lakes at an estimated cost of \$220,000 which are authorized for undertaking but for which funds are not available.

#### Small Boat Harbor Reports

The most important study now under way dealing

with small boat traffic on the Great Lakes is the South Shore of Lake Huron survey report. It is to consider the advisability of additional harbors for small craft between the Straits of Mackinac and the head of St. Clair River. This comprehensive study is now under way but will require about 2 more years for completion. Small boat harbor studies at Vermilion, Ohio and at Saxon, Wisconsin are nearing completion at this time. There is also a comprehensive survey report for small boat harbors on the Coast of Lake Erie at a total cost of \$200,000 and five other small boat harbor studies at a total cost of \$40,000 on the Great Lakes for which necessary funds are not available at this time.

#### Beach Erosion Studies

A beach erosion cooperative survey report is now nearing completion which considers the erosion problem in the vicinity of St. Joseph, Michigan. The only other active beach erosion control study in this Division at this time is on the west end of Lake Erie from the Michigan-Ohio state line to the vicinity of Sandusky.

#### Navigation Improvements now under Construction

The most important navigation project on the Great Lakes under construction at this time comprises deepening of the Connecting Channels as authorized by Congress in 1956 and prior years. The Great Lakes Connecting Channels were the subject of a review survey report undertaken by the District Engineer, Detroit, in 1954, in response to Congressional Committee resolutions to determine the advisability at that time of any further improvements for the accommodation of present and prospective commerce, including the consideration of a channel depth of 27 feet. The recommendation of the Corps of Engineers that a plan of improvement be authorized for the Connecting Channels to provide for a minimum depth of 27 feet below low water datum, with resulting safe vessel draft of 25.5 feet for Great Lakes bulk carriers, was authorized in March 1956.

Funds in the amount of \$5,000,000 have been appropriated for the Corps of Engineers to commence deepening the Connecting Channels during the current fiscal year. The total cost of the entire Connecting Channels project is \$150,000,000. Bids have been received for the work of deepening the upbound Amherstburg Channel in the Detroit River. It is expected that actual work will commence as early as weather will permit next spring. The work of deepening the upbound Middle Neebish Channel in the St. Marys River is also scheduled for commencement next spring.

Provided sufficient funds are made available to carry on this work without interruptions, it is estimated that a controlling depth of 25 feet will be

available for both downbound and upbound deep-draft traffic through the Connecting Channels by June 1960 at which time the separate one-way upbound channels in the Detroit and St. Marys Rivers will have been deepened for 300 of their 600-foot and 500-foot widths, respectively. The deepened portions of these channels will be used for about two years for downbound and upbound traffic during the period of deepening the West Neebish Channel in the St. Marys River, and the Livingstone Channel in Detroit River which must be closed to traffic while such work is in progress. The work is planned for completion so as to provide a controlling depth of 27 feet in all of the channels between the lakes above Lake Erie by June 1962. The entire program for deepening the Great Lakes Connecting Channels is planned for completion by 1963.

#### Other Deep-draft Projects under Construction

Work either under way or proposed for initiation in fiscal year 1957 in the interest of deep-draft navigation, together with the estimated Federal cost includes the following:

- a. St. Marys River. Reconstruction of the obstructive railroad bridge at Bridge Island over the South Canal at the upstream approach to the Soo Locks at an estimated total cost of about \$4,000,000.
- b. Holland Harbor, Michigan. Dredging to improve the inner harbor at a total cost of about \$600,000.
- c. Sheboygan Harbor, Wisconsin. Dredging to improve entrance and river at a cost of about \$200,000.
- d. Toledo Harbor, Ohio. Removal of the center dike in the Maumee Bay Channel at an estimated cost of about \$600,000.
- e. Cleveland Harbor, Ohio. Continuation of the bridge reconstruction program. This bridge reconstruction program has a total cost of about \$19,000,000.
- f. Ashtabula Harbor, Ohio. Construction of an approach channel to the easterly portion of this harbor at a cost of about \$4,700,000.
- g. Oswego Harbor, New York. Construction of a breakwater lakeward of the harbor approach at an estimated cost of about \$2,700,000.
- a. Whitefish Point Harbor on Lake Superior at an estimated cost of about \$700,000.
- b. Harrisville Harbor, Michigan, on Lake Huron at an estimated cost of about \$1,300,000.
- c. Port Austin Harbor, Michigan, on Lake Huron at an estimated cost of about \$1,300,000.
- d. Barcelona Harbor on Lake Erie at an estimated total cost of about \$1,100,000.
- e. Black River Harbor, Michigan, on Lake Superior at an estimated total cost of about \$350,000.
- f. Au Sable Harbor at Oscoda, Michigan, on Lake Huron at a total construction cost of about \$170,000.
- g. Chippewa Harbor on Isle Royale in Michigan, on Lake Superior at a total cost of about \$100,000.
- h. Eagle Harbor on Keweenaw Peninsula, Michigan, on Lake Superior at a total cost of about \$100,000.
- i. Cornucopia Harbor, Wisconsin, on Lake Superior at an estimated cost of \$250,000.
- j. Knife River Harbor, Michigan, on Lake Superior at a cost of about \$300,000.
- k. Inland Route Waterway in Michigan westerly from Cheboygan near the Straits of Mackinac at a cost of about \$300,000.

#### Calumet-Sag Navigation Channel

The project is an important link in the Nation's inland waterway system and connects the Mississippi River system with the Great Lakes via the Illinois Waterway. Improvement of the Cal-Sag Channel will provide channel dimensions and bridge clearances which will permit large modern-sized tows to operate and serve the large industrial area of the Calumet region together with the exchange of cargo in Lake Calumet between barge and lake vessels. Construction was started in December 1955 on the initial dredging contract for the first three miles commencing at Sag Junction. Bids have now been opened for the next 3.1 miles. The work is scheduled for completion in June 1962. The total estimated cost of the project is \$138,800,000 Federal and \$59,900,000 non-Federal. Part I of the project (Sag-Junction to Lake Calumet) is estimated to cost \$106,200,000 of which \$87,700,000 is Federal.

Part I of the project consists of the following:

- a. Widen 16.2 miles of channel from 60' to 225' and deepen to 9'.
- b. Relocate 12 railroad bridges.
- c. Construct one lock 110 x 1,000 feet.

#### Small Boat Harbor Projects under Construction

The program for construction of navigation improvements during this fiscal year in the interest of small boat traffic is rather extensive. Projects under construction this fiscal year include the following:

The large number of railroad bridge relocations involved has greatly increased the planning effort. A considerable amount of work has been required to overcome inertia of railroad operators. The Blue Island group of bridges consists of several inter-related bridges that must be constructed in a definite sequence to assure uninterrupted traffic. A model has been prepared to facilitate planning and construction of this group of bridges. A considerable amount of effort has also been involved in obtaining the required local cooperation due to the numerous interests involved.

#### Flood Control Improvements now under Construction

The following flood control projects are currently active in the Great Lakes area:

- a. A project to afford protection from floods for the urban area of Battle Creek, Michigan is under construction at an estimated total Federal cost of about \$5,500,000. A substantial portion of the work involved in the Battle Creek project is being undertaken by local interests at a total estimated cost of about \$3,000,000.
- b. A local flood protection project in the State of New York for the city of Geneva on Marsh Creek is to be constructed this year at an estimated Federal cost of about \$250,000.
- c. Little Calumet River at Harvey, Illinois. Planning operations are now under way in connection with this local flood protection project which has a total United States estimated cost of \$600,000 and non-Federal cost of \$1,080,000.
- d. Wellsville, New York. Construction is under way at this local flood protection project at an estimated Federal cost of about \$1,000,000.
- e. Local flood protection project for Batavia, New York at an estimated \$350,000 Federal cost has recently been completed.

#### Navigation Projects Recommended to Congress but not yet Authorized

The Omnibus Bill which was considered by the last session of Congress included the following more important navigation projects in the Great Lakes Basin:

- a. Port Washington Harbor, Wisconsin. Construction cost of \$2,900,000 for breakwaters and dredging.
- b. Irondequoit Bay, New York. Construction cost of \$1,900,000 for a small boat harbor on Lake Ontario.

- c. Toledo Harbor, Ohio. Construction cost of \$850,000 for dredging at the mouth of Maumee River and in the vicinity of a ship building company within the inner harbor.
- d. Two Rivers Harbor, Wisconsin, on Lake Michigan. About \$60,000 for dredging.

A recent survey report was completed by the Division Engineer recommending further improvement of Cleveland Harbor comprising bridge modifications at an estimated construction cost of about \$15,000,000. A small boat harbor at Saxon, Wisconsin on Lake Superior was also recently recommended by the Division Engineer at an estimated construction cost of about \$400,000. A favorable report was also submitted by the Division Engineer on the Old Channel at Rouge River, Michigan, at an estimated Federal cost for dredging of about \$100,000.

#### Flood Control Projects Recommended to Congress but not yet Authorized

The Omnibus Bill of 1956 also proposed the following flood control projects in the Great Lakes Basin for authorization by Congress:

- a. Saginaw River Basin, Michigan. A comprehensive system of local flood protection and major drainage improvement projects at an estimated Federal cost of about \$16,000,000.
- b. Kalamazoo River at Kalamazoo. Flood protection project for this city at an estimated Federal cost of about \$5,400,000.
- c. Bad River, Wisconsin, near Ashland. Two local flood protection projects at estimated Federal cost of about \$900,000.
- d. Grand River at Lansing, Michigan. Local flood protection project for this city at an estimated Federal cost of \$9,800,000.
- e. Auburn, New York. Local flood protection project at estimated Federal cost of \$300,000.

#### Beach Erosion Control Projects Recommended to Congress but not yet Authorized

The Omnibus Bill included the following beach erosion control projects for proposed authorization:

- a. Manitowoc-Two Rivers, Wisconsin. Beach erosion control project here at estimated Federal cost of \$49,000.
- b. Fair Haven Beach State Park, New York, on Lake Ontario. A project here at an estimated Federal cost of \$113,000.

- c. Hamlin Beach State Park, New York, on Lake Ontario. A project at an estimated Federal cost of about \$400,000.

#### Navigation and Flood Control Construction Work Authorized but not Yet Initiated

The backlog of navigation and flood control projects which have been authorized by Congress for construction but for which neither detailed advance planning nor construction funds have yet been appropriated have a grand total construction estimated cost of about \$81,000,000.

### PART II

#### RESUME OF CORPS OF ENGINEERS ACTIVITIES IN CONNECTION WITH INTERNATIONAL BOARDS

##### Introductory

I am sure that the members of the Commission are aware of the existence of several of the international engineering and control boards of the International Joint Commission which function in the Great Lakes area. Since Corps of Engineer personnel have been appointed to membership on these boards and their working committees, I am happy to include in my talk the activities of the Corps in this connection.

Perhaps a good way to proceed is to relate briefly the origin and purpose of the International Joint Commission and to outline certain of its procedures including the establishment of its engineering and control boards, and then to follow with a discussion of each of the several boards which operate in the Great Lakes area.

##### Boundary Waters Treaty

The "Boundary Waters Treaty," a treaty between the United States and Great Britain relating to boundary waters, and questions arising between the United States and Canada, was signed at Washington on 11 January 1909, and later duly ratified by the two countries.

For the purposes of the treaty, boundary waters were defined as the waters from main shore of the lakes and rivers and connecting waterways, along which the international boundary between the United States and Canada passes. The definition excluded tributary waters which in their natural channels would flow into such lakes, rivers, and waterways. Obviously, the Great Lakes were a most important consideration in connection with the treaty.

The treaty deals with navigation of the boundary waters and with the use, obstruction, diversion, and pollution of these waters. It was agreed that navigation of the boundary waters shall forever

continue open for the commerce of both countries on an equal basis. The treaty recognized certain uses of the waters which were then in effect and it was agreed that no further or other uses or obstructions or diversions of boundary waters, affecting the natural level or flow of such waters, would be made except by authority of the United States or Canada within their respective jurisdictions and with the approval of an international joint commission.

Article VII of the treaty provided for the establishment of the International Joint Commission of the United States and Canada composed of six commissioners, three from each country. At the present time, the United States Section of the Commission consists of Chairman Len Jordan and Messrs. Roger B. McWhorter and Eugene W. Weber; the Canadian Section consists of Chairman A. G. L. McNaughton and Messrs. George Spence and Lucien Dansereau.

##### Principles under which I. J. C. Operates

In all cases for which approval of the Commission is required under the treaty, the Commission is governed by the following principles adopted by the parties to the treaty: The two countries shall have, each on its own side of the boundary, equal and similar rights in the use of the boundary waters. The following order of precedence shall be observed and no use shall be permitted which tends materially to conflict with any other use of a higher priority:

First = Uses for domestic and sanitary purposes;

Second = Uses for navigation, including the service of canals for the purposes of navigation;

Third = Uses for power and for irrigation.

The foregoing provisions do not apply to any uses of boundary waters existing at the time of the treaty. The requirement for an equal division of the waters may be suspended in cases of temporary diversions where such diversion does not diminish the amount available for use on the other side. The Commission, in any case, may make its approval conditional upon the construction of remedial works to compensate for the particular use proposed, and may require that provision be made for the protection and indemnity against injury of any interests. Certain of the principles are further qualified and elaborated on in the treaty but time does not permit a complete recital here.

##### Procedure of I. J. C.

The more pertinent procedures of the International Joint Commission may be briefly outlined as follows: In cases to be submitted to the Commission under the treaty, the method of bringing such cases to the attention of the Commission and invoking its action is as follows:

First = Where one or the other of the Govern-

ments seeks approval of the Commission, it files with the Commission an application setting forth the facts upon which the application is based, and the nature of the order of approval desired.

Second = Where any private person seeks approval of the Commission, he first makes application to the Government within whose jurisdiction the privilege desired is to be exercised. If such Government is favorable to the application and refers it to the Commission with request for appropriate action, the first procedure then follows.

After an application is duly made, the secretary of the section of the Commission, appointed by the other Government sends to such Government a notice that the application has been made. The secretaries of the two sections then publish notice that the application has been made and that all interested persons are entitled to be heard before the Commission. Appropriate opportunity is provided for filing statements in response to the application and replies thereto, and public hearings are held by the Commission. The Commission may, in the course of the proceedings, make any order which it deems expedient and necessary to meet the ends of justice and to effectually carry out the true intent and meaning of the treaty.

#### Boards and Commission

Many of the Commission's orders of approval have been subject to conditions as to construction of remedial works and conditions as to operation. Ordinarily the Commission's orders of approval have included a clause establishing an international board of control which is responsible to the Commission and whose duties are to insure compliance with the Commission's orders in the particular instance. Also, the Commission has from time to time established boards of engineers to make studies for it of technical problems arising as a result of applications before the Commission. Such boards now in existence in the Great Lakes area include the International Lake Superior Board of Control, the International Massena Board of Control, the International Niagara Board of Control, the International Lake Ontario Board of Engineers and the International St. Lawrence River Board of Control. The latter three boards have appointed international working committees to assist them in carrying out their assignments.

#### Lake Superior Board of Control

The International Lake Superior Board of Control was established by the Orders of Approval, dated 26 and 27 May 1914. The operation of all control works at Sault Ste. Marie was placed under the direct supervision of the Board. The Division Engineer, North Central Division, Corps of Engineers, is the United States member of the Board

and Mr. C. K. Hurst is the Canadian member.

In its Orders of Approval, the International Joint Commission authorized the diversion of waters of the St. Marys River for the production of power at Sault Ste. Marie, Michigan and Ontario. The approval was subject to the construction of certain gates across the river at the head of the rapids, called the compensating works. The approval also required that the flow through these gates and through the power canals be controlled in such a manner as to maintain the levels of Lake Superior between 602.1 and 603.6 as nearly as may be. Engineering studies had indicated that the range of monthly mean lake levels could reasonably be confined to 2.5 feet and ordinarily within the lesser range of 1.5 feet. To guard against unduly high stages of water in the lower St. Marys River, the discharge is to be restricted so that the elevation of the water surface immediately below the locks shall not be greater than 584.5.

#### Massena Board of Control

Pursuant to the International Joint Commissions' Order of Approval, dated 6 December 1922, with respect to the maintenance of the submerged weir in the South Sault Channel of the St. Lawrence River and the regulation of flow through the Massena Power Canal, the International Massena Board of Control was established by the Commission. The Board supervises the maintenance of the submerged weir and the Massena diversion of water from the St. Lawrence River to assure maintenance of water levels in navigation channels of the river in this vicinity.

Membership of the Board consists of the Buffalo District Engineer, Corps of Engineers, for the United States and Mr. T. M. Patterson for Canada.

The St. Lawrence River power project, which is now under construction, maintains water levels for 14-foot navigation during the construction period and will obviate the need for the weir when the project is completed. It is probable that, at some time following the completion of this project, the Massena diversion will be discontinued. When this occurs, the Massena Board would be terminated.

#### Niagara Board of Control

By the Treaty of 1950 between Canada and the United States, the two countries agreed, among other things, to complete certain remedial works in the Niagara River for the preservation and enhancement of the beauty of Niagara Falls. Subsequent to approval by the two Governments of recommendations by the International Joint Commission regarding the nature and design of the remedial works, the Commission established the International Niagara Board of Control on 19 August 1953. The duties of the Board are to review and



approve the design and procedures for the installation of the remedial works, and to exercise control over the operation of the works to insure proper maintenance of the levels of Chippawa-Grass Island Pool above Niagara Falls while meeting the requirements of the Treaty of 1950 for flows over the Falls.

The present membership of this Board of Control comprises as Chairman the Division Engineer, North Central Division, Corps of Engineers, and Mr. Francis L. Adams, Chief, Bureau of Power, Federal Power Commission, for the United States; and Chairman T. M. Patterson and Mr. G. H. Thurber, for Canada.

#### Niagara Working Committee

The Niagara Board's Working Committee makes technical engineering review of the many design and construction details and recommends approval or disapproval by the Board. The Committee also compiles and prepares reports for the Board on water levels and flows. The Working Committee membership consists of the Buffalo District Engineer, Corps of Engineers and Mr. W. R. Farley, Chief, Division of Licensed Projects, Federal Power Commission, for the United States; and Messrs. C. G. Cline and C. W. Morgan for Canada.

#### Niagara Committee

The Treaty of 1950 which I mentioned above is a Treaty between the United States and Canada concerning uses of the waters of the Niagara River. This treaty terminates certain provisions of the Boundary Waters Treaty of 1909 insofar as they apply to the diversions of water of the Niagara River for power purposes. The treaty recognizes the growing need for power and makes provision for utilizing more fully the water resource at Niagara for power purposes while at the same time preserving and enhancing the beauty of Niagara Falls.

The Treaty of 1950 specifies that there be a minimum flow over the Falls of 100,000 c. f. s. during the daylight hours of the tourist season (8 A. M. to 10 P. M. from 1 April to 15 September and 8 A. M. to 8 P. M. from 16 September to 31 October) and a minimum flow over the Falls of 50,000 c. f. s. at all other times.

The two Governments have established the International Niagara Committee whose purpose is to measure and supervise power diversions from the Niagara River and the flow over Niagara Falls to insure compliance with the treaty requirements. The two Governments have appointed the Division Engineer, North Central Division, Corps of Engineers, for the United States and Mr. T. M. Patterson for Canada to membership on this Committee. You will note that the membership is identical with the chairmanship of the Niagara Board of Control which is advantageous since the duties are, in a

sense, interrelated. The Niagara Committee is responsible to the Departments of State of the two Governments.

#### Lake Ontario Board of Engineers

On 25 June 1952 the Governments of Canada and the United States referred the problem of regulating the levels of Lake Ontario to the International Joint Commission for investigation and report. The outflows of Lake Ontario will be controlled, of course, when the St. Lawrence Project is completed. The Governments' letter of reference states the problem as follows: Determine, having regard to all interests, whether measures can be taken to regulate the level of Lake Ontario for the benefit of property owners on its shores in the United States and Canada so as to reduce the extremes of stage which have been experienced.

The International Lake Ontario Board of Engineers was established by the International Joint Commission on 10 April 1953 to investigate the problem. The members of the Board are Mr. G. A. Hathaway, Office, Chief of Engineers, for the United States and Mr. T. M. Patterson, for Canada.

#### Lake Ontario Working Committee

The Lake Ontario Board appointed as members of the International Lake Ontario Working Committee the Division Engineer, North Central Division, Corps of Engineers, Chairman of the United States Section and Mr. F. F. Snyder, Office, Chief of Engineers as member, with Mr. R. H. Clark, Chairman of the Canadian Section and Mr. R. H. Smith as member.

The appointments were made with a view to the utilization of the service of engineers and the data of technical agencies of the United States and Canada. For example, this arrangement makes possible the use of the personnel and experience of the U. S. Lake Survey, Corps of Engineers. The Working Committee has conducted studies of the various factors which affect the fluctuations of water levels on Lake Ontario and studies of the regulation of Lake Ontario for the Board.

The Lake Ontario Board and its Working Committee will exist only as long as necessary for the Board to complete the investigation assigned to it. One of the major responsibilities of this Board has been the studies leading to the development of a regulation plan for Lake Ontario in connection with the St. Lawrence Seaway and power projects.

#### St. Lawrence River Board of Control

The International Joint Commission in its Order of Approval, dated 31 October 1952, pertinent to the applications of the Governments of Canada and the United States regarding the construction of works



for power development in the International Rapids Section of the St. Lawrence River, established the International St. Lawrence River Board of Control. During the construction period, the duties of this Board are to keep informed of the construction plans insofar as they relate to water levels and flows and advise thereon. Upon completion of the works, the duties will be to insure that provisions of the Order of Approval relating to water levels and the regulation of the discharge of water from Lake Ontario are followed.

The members of the United States Section of the St. Lawrence Board of Control are Mr. G. A. Hathaway, Chairman, and Messrs. F. L. Adams and B. D. Tallamy; for Canada, Mr. T. M. Patterson, Chairman, and Messrs. J. B. Bryce and Rene Dupuis. Here again it will be noted that the Chairmen of the St. Lawrence Board of Control and the members of the two-man Lake Ontario Board of Engineers are identical.

#### St. Lawrence Board's Working Committee

The Working Committee of the International St. Lawrence River Board of Control will carry on future studies of the regulation of Lake Ontario within the limits and criteria established by the studies of the Lake Ontario Board of Engineers. The membership of this Working Committee is the same as that of the Lake Ontario Working Committee with the addition of two members from each country, Messrs. J. B. McMorran and J. H. Spellman for the United States and Messrs. Y. deGuise and R. A. Walker for Canada.

#### St. Lawrence Board's Field Representatives

The International St. Lawrence River Board of Control has appointed Field Representatives to assist the Board in performing its duties during the construction period. The Field Representatives, consisting of the District Engineer, U. S. Lake Survey for the United States, and Messrs. C. K. Hurst and R. H. Clark for Canada, keep abreast of construction activities and inform the Board of the effects of these activities on water levels and flows.

#### Summary re International Boards

With respect to the United States interests, the responsibility for hydraulic investigations pertaining to the Great Lakes and the international section of the St. Lawrence River is assigned to the Corps of Engineers. Such investigations are carried out by the U. S. Lake Survey under the supervision of the Division Engineer, North Central Division. The Corps of Engineers is also responsible for all Federal navigation, flood control and beach erosion activities in the area. As I have noted, the Corps is represented on each of the international boards

and committees concerned with boundary water problems in the Great Lakes area. These assignments with regard to Federal engineering responsibilities and board memberships result in effective and coordinated action on all such boundary water problems. I might add that where major power interests are involved, the Federal Power Commission is also represented on the appropriate international boards and committees, which is a logical and effective arrangement.

#### CONCLUSION

The target date for completion of our survey report on Water Levels of the Great Lakes is 30 June 1957. Prior to completion of the report, results of the studies will be discussed with representatives of the Governors of the Great Lakes States. The members of the Great Lakes Commission will be invited to the conference. In accordance with recent instructions, an interim report to the Lake Level study pertaining only to consideration of diversion from Lake Michigan is being prepared for submission to the Chief of Engineers by 1 January 1957. Results of this interim report will be discussed with representatives of the Governors of the Great Lakes States on 13 December 1956. The Great Lakes Commission will be invited to this conference.

The Great Lakes Harbors survey is under way. The initial of a series of public hearings on this comprehensive study has been held and the remaining hearings are scheduled during the next four months. The findings and recommendations of the District Engineers on the individual harbors considered for deepening will be submitted to higher authority in appropriate interim reports which will precede submission of a final report to fulfill the directive from Congress for this Great Lakes-wide investigation.

Construction of the project for deepening the Great Lakes Connecting Channels will be under way this fiscal year with funds now available in amount of \$5,000,000. A modern and adequate waterway to join the Great Lakes deep-draft navigation system with the great Mississippi-Ohio Rivers inland waterways system is now under construction by the improvement of the Calumet-Sag project of the Illinois Waterway.

The above elements of the water resources program of the Great Lakes area, together with numerous other surveys and construction work involving navigation improvements in the interest of deep-draft and small-boat navigation and the important flood control program which is also currently under way, will certainly contribute much toward bringing about an even greater economic prosperity for Mid-America.

There are nine international boards and committees operating in the Great Lakes area -- the Boards of the International Joint Commission including the Lake Superior Board of Control, the Massena Board

of Control, the Niagara Board of Control and its Working Committee, the Lake Ontario Board of Engineers and its Working Committee, the St. Lawrence River Board of Control and its Working Committee, and the Niagara Committee which is not an international Joint Commission Committee but is responsible to the State Departments of the

two Governments. Corps of Engineer personnel have been appointed to membership to the United States Sections of all of these boards and committees. This arrangement makes effective and coordinated use of Corps of Engineers personnel and facilities in considerations of boundary water problems.

## U. S. PUBLIC HEALTH SERVICE: PROGRESS REPORT ON WATER SUPPLY AND WATER POLLUTION CONTROL IN THE GREAT LAKES AREA

by D. W. Evans

Regional Engineer, Upper Mississippi & Great Lakes Drainage Basins

The Public Health Service is pleased to receive your invitation to present this report to the Great Lakes Commission at its annual meeting, in order to bring before you some current and recent developments. Surgeon General Scheele, in expressing our interest in working with you a year ago, stated: "We are pleased by the progress already made in the development of the Great Lakes Basin compact and will cooperate in every way possible in promoting the further development of the water resources of the Great Lakes Basin."

Your staff requested us to report upon programs pertaining to the Great Lakes under way or proposed. In regard to this I should like to point out that the Public Health Service programs are cooperative with the states and through them with the local communities. Thus, this report cannot be considered in any respect as a summary of Public Health Service accomplishments since all of the states in the Great Lakes Basin are partners in the program of water resources protection.

The population within the Great Lakes Basin is approximately 19 million people. In this area some 925 communities with a population estimated at 15 million are served by water and sewer systems. Nearly 180 communities representing over 13 million people have as their water source the Great Lakes and their connecting rivers. The sewage from most of the communities also reaches the Great Lakes.

The Public Health Service, in cooperation with the state water pollution control agencies, published summary reports on this subject in 1951. Data on the Great Lakes area are contained in three booklets entitled, "Western Great Lakes Drainage Basin," "Lake Erie Drainage Basin," and "North Atlantic Drainage Basins." These reports show 497 municipal sewage treatment works serving over 10 million people and 415 industrial waste treatment plants in operation in the Great Lakes area. During the period 1951-54, an additional 97 municipal sewage treatment plants, serving 1.8 million people, and 160 industrial waste treatment works were placed in operation.

A report of progress in sewage treatment for the fiscal year 1955-56 within the Great Lakes Basin is difficult at this time since all of the states have not reported. A partial report covering the five states of Illinois, Indiana, Michigan, Ohio, and Wisconsin shows the completion of 41 plants serving 800,000 people. At the same time 29 plants were under construction to serve 3,458,000 people. Plans are ready

for the construction of 36 plants to serve 278,000 people. As to industrial waste treatment plants, 33 were completed, 23 were being built, and 15 were in the planning stage. All of the state water pollution control authorities in the Great Lakes Basin have been very active and alert and it is fair to assume that such progress is general. Much, however, remains to be done. Many treatment works are now inadequate and the problems of extending old plants are as acute as those attending the construction of new works.

The control of pollution in the boundary waters is vested in the International Joint Commission established by the Treaty of 1909, between the governments of Canada and the United States. Portions of the boundary waters involving St. Clair River, Lake St. Clair, the Detroit River, St. Marys River, and the Niagara River were extensively surveyed beginning in 1946 and reported by the Commission in 1951. Objectives for Boundary Water Quality Control were adopted and Advisory Boards to the International Joint Commission on Control of Pollution of Boundary Waters have been established by the Commission to assist in carrying out these objectives.

The Public Health Service, functioning in close collaboration with the states, maintains field units in Detroit and Buffalo for the U. S. Section of the International Joint Commission, and the National and Provincial Health agencies provide field services for the Canadian Section of the Commission. The field activities include collection of basic water quality data, studies of trans-boundary travel of pollution, determination of improvements effected by municipal and industrial waste treatment, assembly of data on water uses, application of new analytical techniques (carbon filter, bioassay, etc.) in boundary water pollution control investigations, and other such work involved in providing information to assist the International Joint Commission in carrying out its functions relating to boundary water quality.

The International Joint Commission and its Advisory Boards meet periodically to review progress being made, to indicate where needs exist for putting remedial measures in effect for control of pollution, and to see that such findings are brought to the attention of the appropriate enforcement agency. The Commission is performing an important role in securing the installation of sewage and industrial waste treatment works and other improvements to

abate pollution of the boundary waters. An international system for warning downstream water users following industrial waste spills has been established. Cooperative working relations are maintained with state and provincial water regulatory agencies. Representations made by the Commission were an important factor in the recent enactment of legislation creating the Ontario Water Resources Commission and providing suitable means for financing, constructing, and operating of sewage treatment works in the Province of Ontario.

Waters that are unsuitable as a source of domestic supply also have been impaired for recreational uses. The Great Lakes Basin is one of the outstanding recreational areas of America. Values of beach properties run into many millions of dollars and the annual income of the tourist and resort business is enormous. Millions of people visit the lakes for swimming, boating, and fishing. If these recreational values are decreased it may mean severe economic loss to lakeshore communities and deprive citizens of recreational opportunities.

The relation of water quality to the Great Lakes fisheries is less clear. Conditions that damage water as a source of municipal supply may have little effect on the fisheries or may even be beneficial. On the other hand, excessive pollution may have strongly adverse effects on the fisheries and further study is needed.

In the field of domestic water supplies, the major development has been the extension of the distribution systems in the larger metropolitan centers; such as Chicago, Milwaukee, Detroit, and Cleveland. Studies are under way to consider means of serving water to more communities inland, particularly in the Chicago, Detroit, and Cleveland areas. These studies may indicate new lake intakes and treatment works. Other problems being considered are the extension of intakes to avoid shore contamination.

Your Commission is undoubtedly interested in the new Federal Water Pollution Control Act of the 84th Congress, known as Public Law 660. This law extends and improves the old Act known as Public Law 845, 80th Congress, which expired in June, 1956. The purposes of the new Act may be stated briefly as follows:

1. To recognize, preserve, and protect the primary responsibilities and rights of the States in preventing and controlling water pollution;
2. To support and aid technical research relating to the prevention and control of water pollution;
3. To provide Federal technical services and financial aid to state and interstate agencies and to municipalities in connection with the prevention and control of water pollution.

This Act authorizes some activities not included in the old Act, such as grants-in-aid agencies, institutions, and individuals for training, research, and demonstrations. While funds for some of these activities were not made available in Fiscal Year 1957 appropriations, grant funds were provided to assist state and interstate agencies in carrying out their programs. These funds, administered on a matching basis, amount to \$2 million for Fiscal Year 1957.

Much interest has been shown in Section 6 of the Water Pollution Control Act, which authorizes Federal grants to assist municipalities in the construction of sewage treatment works. Fifty million dollars annually for ten years is authorized for this purpose, and such an amount has been appropriated for this fiscal year. The grants may be used for advance planning of sewage treatment facilities, including engineering, legal and fiscal investigations, and also including surveys, design, plans, and specifications in preparing for the construction of sewage treatment plants, as well as for the actual construction of treatment plants and alteration, expansion, replacement, or addition to existing facilities. Treatment plants are defined as including interceptor sewers, outfall sewers, and pumping equipment. Grants may be made for 30 per cent of the cost of approved projects up to a maximum of \$250,000 for any one project.

By the specific terms of the Act, six basic requirements must be met for a project to be eligible for a Federal construction grant:

1. The project must be approved by the state water pollution control agency of the state in which the project is located.
2. It must conform to a state water pollution control plan submitted pursuant to the provisions of the Act.
3. It must be included in a comprehensive water pollution control program prepared or developed by the Public Health Service in accordance with the Act.
4. The applicant must agree to pay the remaining construction costs.
5. The applicant must make provision for insuring proper and efficient operation and maintenance of the project after construction.
6. The project must be certified by the state water pollution control agency of the state in which it is located as entitled to priority over other eligible projects on the basis of financial as well as water pollution control needs.

In determining whether a Federal grant should be made, the Surgeon General is required by the Act to give consideration to the public benefits to be

derived from the project, the propriety of Federal aid in its construction, the relation of the ultimate costs of construction and maintenance to the public interest and public necessity and the adequacy of provisions made by the applicant for operation and maintenance.

The law provides for state-by-state allocation of grant funds. This has permitted a large degree of decentralization of operations to the regional offices. Since the passage of the Act, considerable progress has been made in developing procedures for the administration of construction grants pro-

gram. The application forms are now going out to the states and communities. The traditional Public Health Service policy of operating its programs through the states will pose some problems of coordination, but we believe the results will justify such additional effort.

The construction grants program is but a part of the total program of water pollution control. Much work yet remains to be done, but we believe the pollution problem can be solved through a unified approach of all governmental and private agencies interested in water resources conservation.

## GREAT LAKES FISHERY COMMISSION: ROLE OF THE COMMISSION IN THE SOLUTION OF FISHERY PROBLEMS

by James W. Moffett  
Acting Executive Director<sup>1</sup>

The Great Lakes Fishery Commission was established by treaty between the United States and Canada.<sup>2</sup> It was organized formally in Ottawa, Canada, on April 23, 1956, and consists of three commissioners from each country who, in turn, constitute their respective national sections. In operation, each national section of the Commission functions and votes as a unit. All actions taken by the Commission must be unanimous. As presently constituted the United States Commissioners are: John L. Farley, Director, Fish and Wildlife Service and Chairman of the Commission; Mr. Claude Ver Duin, Secretary, Grand Haven, Michigan Chamber of Commerce; and Mr. Lester P. Voigt, Director, Wisconsin Conservation Department. The Canadian Commissioners are: Dr. Andrew L. Pritchard, Director, Conservation and Development Service, Department of Fisheries, and Vice-Chairman of the Commission; Dr. W. J. K. Harkness, Chief, Division of Fish and Wildlife, Ontario Dept. of Lands and Forests; and Dr. A. O. Blackhurst, Manager, Ontario Council of Commercial Fisheries. The duties and objectives of the Commission are states in the Convention which established it. To outline the Commission's role in the solution of problems confronting all Great Lakes fishing interests, I shall read pertinent articles from the Convention. The Convention provides in Article IV:

"The Commission shall have the following duties:

- (a) to formulate a research program or programs designed to determine the need for measures to make possible the maximum sustained productivity of any stock of fish in the Convention Area which, in the opinion of the Commission, is of common concern to the fisheries of the United States of America and Canada and to determine what measures are best adapted for such purpose;
- (b) to coordinate research made pursuant to such programs and, if necessary, to undertake such research itself;
- (c) to recommend appropriate measures to the Contracting Parties on the basis of the findings of such research programs;
- (d) to formulate and implement a comprehensive program for the purpose of eradicating or minimizing the sea lamprey populations in the Convention Area; and
- (e) to publish or authorize the publication of scientific and other information obtained by the Commission in the performance of its duties."

Article V authorizes the Commission to conduct investigations, to take measures and install devices in the Convention Area and its tributaries for lamprey control, and to hold public hearings. Article VI requires the Commission to make use of official agencies of the Contracting Parties to the extent feasible, and authorizes it to make use of private or other public organizations or any person. The Convention is precise in its statement of duties. The Commission is to concern itself with three things, i. e., what we may call general fishery research, lamprey control, and the dissemination of information. It is to make maximum use of existing agencies.

Let us examine more closely the Commission's duties with regard to general fishery research and lamprey control. In the field of lamprey control, we are to develop and carry out a program. The Governments have placed ultimate responsibility for completion of the program in the Commission and have provided means for it to obtain the needed funds.

The pattern is different with regard to general fishery research. Although the Commission is directed to formulate a research program, it is empowered only to coordinate research made pursuant to such a program. The two Governments did not intend that, as a general rule, the Commission engage in major research activities on its own, nor did they intend that the Commission direct the research activities of existing agencies in the two countries. It is to formulate a program, looking to existing agencies to carry it out, and it is to coordinate the work of these agencies. Finally, it is to recommend management procedures to the two Governments.

This distinction between operating patterns appears to be entirely reasonable. A lamprey control program requires a high degree of centralization to

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<sup>2</sup>Much of the information given here on the program of the Great Lakes Fishery Commission is based on the talk "The Role of the Great Lakes Fishery Commission in the solution of Great Lakes Problems" by John L. Farley, Chairman of the Commission, at the 86th Annual Meeting of the American Fisheries Society. The full text of the talk will appear in Volume 86 of the Transactions of that organization.

insure continuity and uniformity in the quality of work. To be successful, the program must insure the eradication of virtually all the lampreys. A concerted, centrally directed effort is thus required.

The research problem is somewhat different. Fishery research in the Great Lakes is not new. Scientists of both countries have been working in the Lakes for many years and they have learned a great deal about the fishes of the Lakes, but the problems are more difficult than most. Each lake has peculiarities which require that it be studied separately. On the other hand, the lakes have similarities which bind them together. The research problems in the lakes are something like coastal problems in marine fisheries, only they are much larger problems for there are some 9,600 miles of Great Lakes coastline.

A new research organization with a large staff of its own does not appear necessary to attack these problems. What is needed is a means of bringing the scientists and administrators of the several existing organizations together formally in order to apply the knowledge of these people to a truly joint approach to Great Lakes fishery research problems; to have them develop a comprehensive program that promises solution to these problems; to have them agree among themselves on the role which each agency could best play in implementing such a program; and to encourage them to increase their efforts to the maximum. Once a program is in operation, a joint review of progress will be needed, modifications and shifts in emphasis must be made as required by newly discovered facts, and finally, the findings must be reviewed and recommendations made to the two Governments.

To recapitulate, in the field of lamprey control the Commission will plan and carry out a control program; in general research, the Commission will work more as a catalyst, a means of focusing the attention of the various research agencies in a area-wide problems, a means of filling in the present gaps.

You will understand that the Commission is empowered to undertake research on its own if necessary. It does not appear to us now that such activity will be necessary. However, should we find that existing agencies are unable to conduct certain studies which we believe to be required, we would undertake these studies as a Commission, either with a staff of our own, or on a contract basis.

With these two different functions in mind, let us now look at the mechanics. The Commission is new, of course, and our thinking is not completely crystalized on some phases of our work. We have, however, decided to employ a small staff headed by an Executive Secretary. We have also decided to locate the staff in Ann Arbor, Michigan, a city centrally located and a center of fresh-water fishery research. Until a permanent appointment is made, Dr. James W. Moffett is filling the position as Executive Secretary, on loan from the Fish and Wildlife

Service. We have also appointed a Scientific Advisory Committee to provide us with expert advice. It is empowered to have such advisors as it may desire. The Executive Secretary is Chairman of this Committee. Its other members are Dr. W. A. Kennedy of the Fisheries Research Board of Canada, Mr. Norman Baldwin of the Department of Lands and Forests of the Province of Ontario, Dr. Moffett, and Dr. Charles Dambach of the Natural Resources Institute, Ohio State University.

This Committee is, in our opinion, a most critical part of the organization. With its advisors, it will be a scientific body representing all areas, familiar with the views, capabilities and problems of the Federal, State and Provincial agencies, able to discuss problems, sift information and present sound recommendations to the Commission. It will, we hope, be instrumental in the coordination of research.

We look to the Scientific Advisory Committee to draft for our approval a comprehensive lamprey control program. When we have approved a program, we shall then turn to the two Governments for funds to carry it out. We consider ourselves fortunate to be able to contract with the United States Fish and Wildlife Service and the Fisheries Research Board of Canada to do the work for us. The Executive Secretary will maintain close liaison with these agencies to insure that the work is being carried out as specified, and the Scientific Advisory Committee will review developments and recommend modifications and additional work to the Commission.

As another means of achieving a high degree of coordination, the two National Sections of the Commission are authorized to appoint advisory committees. These groups, appointed in accordance with United States and Canadian law and policy, will provide additional forums for stimulating interest and cooperation, for discussing needs and capabilities. We believe these national advisory committees will contribute greatly to the development and coordination of a sound program.

I would emphasize that these arrangements are not permanent. We must learn as we go along and change our organization as situations require.

I have attempted to give you a picture of the duties which the Convention has placed upon the Great Lakes Fishery Commission, and the way in which the Commission proposes to discharge these duties.

Because of the urgency of the problem and its budget requirements, the Commission has found it necessary to move rapidly in the adoption of lamprey control programs for the fiscal year ending on June 30, 1957. We were not able to wait for the formation of the Scientific Advisory Committee or for consultation with agencies other than the Fish and Wildlife Service and the Fishery Research Board. At our first meeting in Ottawa in April 1956, we adopted a program for the fiscal year ending June 30, 1957.

The program is virtually that proposed by the two Federal research agencies. It contemplates completion of the sea lamprey control network of electro-mechanical barriers on streams tributary to Lake Superior, the installation of 55 barriers on Lake Michigan, the initiation of extensive surveys of the streams tributary to North Channel, Lake Huron, and continued work on the testing of selective poisons for use on lamprey larvae. The program, which has been approved by the two Governments, is expected to cost in the neighborhood of one million dollars. We have entered into a contract with the Fish and Wildlife Service for work in the United States. The Fishery Research Board is carrying out the program in Canada. The work is under way, and progress reports which we received at our meeting on July 30 and 31 were gratifying.

We have also been obliged to work out a lamprey control program for the next fiscal year, that ending June 30, 1958. We plan a substantial expansion of the program over that now in progress. We hope to complete the network of barriers in Lake Michigan, construct all necessary barriers on the United States side of Lake Huron, and begin the construction of barriers on the Canadian side of Lake Huron and on the North Channel and Georgian Bay. We hope also to have by the end of 1958 some definite answers regarding the use of poisons. This program is of course based upon present knowledge. It was developed by experts from the two Federal agencies, and adopted by the Commission with modifications recommended by our Scientific Advisory Committee. It may well be modified in the coming months as we learn more and as we obtain advice from other agencies. The lamprey problem is an immense one. At the present we are working with the problem where its effects have been felt most severely - the upper Lakes. In the near future, we hope to turn our attention to Lakes Erie and Ontario, and the St. Lawrence River.

The Commission has not been required to act with such speed in the development of a research program. We have not yet attempted to set down a comprehensive statement of the problems and the best ways of attacking them. At our Ottawa meeting in April of this year, we did ask the scientists from the two countries to draw up for us a very general statement of the fishery situation in the Great Lakes.

The scientists reviewed briefly the status of deep-water species, pointing particularly to the effects of the sea lamprey upon the lake trout populations and the changes in the cisco populations which appear to have resulted from the disappearance of lake trout. Our attention was drawn to the random fluctuations in whitefish populations and the undetermined effect of the sea lamprey upon whitefish.

The scientists also explained that the bulk of the production of the Great Lakes is composed of shallow-water species, such as dominate the fish faunas of Lake Erie, Lake St. Clair, Green Bay, Saginaw Bay,

the Bay of Quinte, and the shallow parts of Georgian Bay. The commercial catch in Lake Erie, for example, is about equal to that of all species in the other four lakes. The smelt is believed to be a key member of the shallow-water communities of fishes, because it is competitive with other species. All of these species fluctuate to an extraordinary degree. The fluctuations make fishing in these areas acutely unstable, more so than is true of most fisheries in other areas. The causes of these fluctuations are not understood, and thus they cannot be predicted.

In conclusion, the scientists suggested that the most pressing problems of the Great Lakes fall into three general categories:

1. Finding means of restoring the lake trout as the sea lamprey control program gains in effect;
2. Learning the causes of natural fluctuations in abundance of the several species so as to predict and perhaps even control fluctuations;
3. Determining the relation between fishing intensities and yields to form a scientific basis for regulation of fishing rates which will maintain maximum sustained yields.

This is, of course, the merest beginning of an attack upon the general problem facing the Commission. In the months to come, much thought must be devoted to the development of a program. In the meantime, the two Federal agencies have drawn up tentative research programs which they propose to carry out during the next fiscal year. We have given our blessing to these programs in order that the agencies may proceed with the procurement of funds. These programs are a nucleus about which, we hope, a comprehensive program can be developed involving the research agencies of the states and other organizations.

With regard to the comprehensive research program, as the scientists pointed out to us in Ottawa:

"An adequate research program cannot spring into full being in one session of a committee. The development of a good program is in itself a problem for research."

Our task is an enormous one. Our Scientific Advisory Committee is giving close study to it. The thinking, knowledge, and experience of all concerned with the fisheries of the Great Lakes will be required if the work is to be done effectively. We hope that the Commission will provide a means of bringing about a concerted attack on Great Lakes fishery problems. We hope that it will serve to emphasize the importance and difficulty of these problems, and in so doing stimulate interest and action toward their solution.



ST. LAWRENCE SEAWAY DEVELOPMENT CORPORATION:  
PROGRESS ON THE ST. LAWRENCE SEAWAY PROJECT

by Harry C. Brockel  
Member of the Advisory Board

On behalf of the St. Lawrence Seaway Development Corporation, the new agency created by Congress in 1954 to build and operate the St. Lawrence Seaway on the American side of the international boundary, it is a pleasure to report to the Great Lakes Commission that substantial progress is being made on the St. Lawrence Seaway and Power Project, and that this gigantic engineering undertaking is going forward on schedule.

President Eisenhower signed the Wiley-Dondero Seaway Act on May 13, 1954. By August of 1954, an army of men and machines was being mobilized for this great international construction job.

As of this date, both the United States and Canada have completed approximately twenty per cent of the navigation works in their respective areas. Twelve thousand men and an immense force of machinery are working around the clock six days a week, to meet the target date for generation of hydro-electric power in July, 1958, now only twenty months away. Full-scale 27-foot navigation is scheduled for the spring of 1959.

The two large navigation locks on the American side of the international boundary are going forward on schedule. Contracts for the Eisenhower Lock are 25 per cent complete, and work on the Grasse River Lock is sixteen per cent complete. Five thousand cubic yards of concrete are being poured every 24 hours on these gigantic locks, and improved construction procedures will permit this work to go forward during the winter months, except when extreme weather conditions prevent work. An estimated one million cubic yards of concrete will go into the Eisenhower and Grasse River Locks.

As of August 31, 1956, the St. Lawrence Seaway Development Corporation had made contract commitments in excess of \$75,500,000. Additional important segments of the Seaway work will be in the bidding process late this year. The general contract for the Grasse River Lock is in the amount of \$26,753,000. The Eisenhower Lock will cost \$20,172,000. The ten-mile Seaway canal in American waters (the Long Sault Canal) will cost in excess of \$17,000,000.

Extensive dredging is in process in the Thousand Islands section. The St. Lawrence River flows over a limestone bottom in this locality and it is necessary to remove 33 rocky shoals between Clayton and Alexandria Bay, to provide 27-foot navigation through the Thousand Islands. This job is under contract in

the amount of approximately \$4,800,000, for the removal of 240,000 cubic yards of rock. The cost of approximately \$20 per cubic yard for drilling, blasting, and dredging the rocky bottom of the river is indicative of the difficult nature of the work.

Extensive dredging, running into many millions of cubic yards, is also necessary to remove shoals from the area between the Thousand Islands and the Iroquois control dam, and in the channels east of the Grasse River Lock.

We do not presume to report for the New York State Power Authority, nor the Ontario Hydro-Electric Commission, who are building the \$600,000,000 power dam and control dams for the power phase of the Seaway Project. However, the power project is moving on schedule, and there is an absolute determination to generate power from the International Rapids by the late summer of 1958. The huge power dam across the St. Lawrence River, one of the largest dams in the world, is rapidly taking form on both the American and Canadian sides of the St. Lawrence. The main channel of the river has been de-watered by the construction of a coffer dam 4200 feet long, the largest coffer dam in the history of the world. The dam is being built in the "dry", and it is possible to see this enormous structure taking form from its very foundations, up to the great gantry cranes on top of the dam which will operate the flood gates.

Similarly, no attempt is made here to report officially on the progress of Canadian work on the St. Lawrence Seaway. However, from personal observations, it can be reported that the Canadian aspects of the Seaway are in full progress, with large-scale work on the Canadian side extending all the way from Montreal harbor, where the new Lachine Locks are taking form, up to the vicinity of Iroquois and Cornwall, where large-scale navigation and power work is under way in Canadian waters. Both navigation and power projects on the Canadian side are being coordinated with American construction schedules, so that both work programs and completion dates are being carefully coordinated. On the Canadian side of the river, the relocation of railroads, highways, and the re-settlement of the cities of Cornwall, Iroquois, Morrisburg, and other localities, are well along. Some thousands of persons on the Canadian side of the river must be relocated, because the principal flooding by the new power pool will occur in Canadian territory.

One of the interesting aspects of the project is the abandonment of New York Central Railroad service between the United States mainland and Cornwall, Ontario. At this point, the New York Central Line enters Canada, but it will be abandoned and a high level highway bridge will be constructed across the south channel of the St. Lawrence River to replace an antiquated railway and highway bridge which now serves Cornwall, Ontario from the American side.

Construction of all phases of the Seaway and Power Project is now in full swing, extending all the way from Port Colborne at the Lake Erie end of the Welland Ship Canal, up to Montreal harbor, a distance of 368 miles. More than \$900,000,000 is being expended by the United States, Canada, Ontario and New York, for one of the largest engineering undertakings in the history of the world. This enormous engineering task is currently featured in scores of engineering, business and shipping publications in many parts of the world. Some writers have described the building of the Seaway as "the greatest construction show on earth", which is probably an accurate, if dramatic, description of the job being done by an army of men and machines.

It is strongly recommended that if at all possible, members of the Great Lakes Commission and their related state agencies, endeavor to visit the

Seaway Project during the climactic stage of construction in 1957 and 1958. The work will be at its full peak in the summer of 1957. It is a rare privilege and an experience to see from the air, from the land, or from the water, the re-shaping of the St. Lawrence River Valley. The North American continent will never see another construction job of this magnitude, and it is an opportunity not to be missed, especially for those with a special interest in water resources, navigation and engineering matters.

The job is monumental, not only as an engineering work of the first magnitude, but as one of the most intricate tasks of engineering and diplomatic coordination ever achieved, involving two national governments, state and provincial governments, regulatory commissions, engineering agencies, local units of government, and literally scores of contracting firms and consultants.

On behalf of our Corporation, I desire to make special mention and to pay special tribute to the U.S. Corps of Engineers, whose long study and careful advance engineering of the St. Lawrence Project, makes possible its completion in a four and one-half year period instead of the seven years which it was originally thought would be required to complete the job.

**FEDERAL MARITIME BOARD AND U. S. MARITIME ADMINISTRATION:  
DEVELOPMENTS RELATING TO THE GREAT LAKES-ST. LAWRENCE SEAWAY AREA**

Acting under the authority granted in Section 211 of the Merchant Marine Act of 1936, the Maritime Administrator declared on February 8, 1956 that the Great Lakes/Western Europe trade route, designated as United States Foreign Trade Route No. 32, is essential to the trade, commerce and defense of the Nation.

The determination of the Federal Maritime Board that the Great Lakes encompasses an essential foreign trade artery of the United States does two major things. It puts upon the Government the responsibility to assure that this essential route shall be properly serviced according to law; but secondly, and perhaps much more importantly, it opened a vista for the entire Great Lakes and its adjoining territories that makes this vast region an integral part of the great complex of American ocean shipping. Matters of deep water traffic that heretofore have been of only minor concern to the ports of the Great Lakes must now become matters of vital interest. The Great Lakes area has become, and now shares, the possible advantages and the full responsibilities of another seacoast of the United States.

Section 211 of the Merchant Marine Act of 1936 authorizes and directs the Maritime Administration to investigate, determine, and keep records of, the ocean services, routes and lines from ports in the United States, or in a territory, district or possession thereof, to foreign market which are, or may be, determined by the Maritime Administration to be essential for the promotion, development, expansion, and maintenance of the foreign commerce of the United States.

The Administration is charged under the law to consider and give due weight to the number of sailings and types of vessels that should be employed on such routes and to give added consideration to the benefit the maintenance of such lines may afford to the foreign commerce and the defense of the United States.

In all these determinations the law calls upon the Maritime Administration to make its findings in keeping with "facts and conditions that a prudent business man would consider in dealing with his own business."

In all of its determinations the Maritime Administration is guided by the Declaration of Policy of the Merchant Marine Act, 1936, which states that:

"It is necessary for the national defense and the development of its foreign and domestic commerce that the United States shall have a merchant marine sufficient to carry its do-

mestic water-borne commerce and a substantial portion of the water-borne export and import foreign commerce of the United States and to provide shipping services on all routes essential for maintaining the flow of such domestic and foreign water-borne commerce at all times."

The Merchant Marine Act further charges the Maritime Administration with the responsibility of assuring that this American Merchant Marine shall be "capable of serving as a naval and military auxiliary in time of war or national emergency" and fixes as a further requisite that it be owned and operated under the United States flag by citizens of the United States, insofar as may be practicable, and that it be composed of the best-equipped, safest, and most suitable types of vessels, constructed in the United States and manned with a trained and efficient citizen personnel.

The Congress of the United States has declared it to be the policy of the United States to foster the development and encourage the maintenance of such an American Merchant Marine.

The statute governing the activity of the Administration in ports on the Great Lakes is the Merchant Marine Act of 1920, Section 8 of which shoulders the Administration, in cooperation with the Department of the Army, with the duty of promoting, encouraging, and developing ports and transportation facilities in connection with water commerce over which it has jurisdiction, to investigate territorial regions and zones tributary to such ports, taking into consideration the economies of transportation by rail, water, and highway and the natural direction of the flow of commerce; to investigate the causes of congestion of commerce at ports and the remedies applicable thereto; to investigate the subject of water terminals, including the necessary docks, warehouses, apparatus, equipment, and appliances in connection therewith, with a view to devising and suggesting the types most appropriate for different locations and for the most expeditious and economical transfer or interchange of passengers or property between carriers by water and carriers by rail; to advise with communities regarding the appropriate location and plan of construction of wharves, piers, and water terminals; to investigate the practicability and advantages of harbor, river, and port improvements in connection with foreign and coastwise trade; and to investigate any other matter that may tend to promote and encourage the use by vessels of ports adequate to care

for the freight which would naturally pass through such ports ....

The Maritime Administration is active in varying degrees in all the port development items specifically listed in the foregoing with the exception of the investigation of port congestion, a subject which is not of present concern.

In the matter of investigating the tributary territory of Great Lakes ports the Maritime Administration is currently leaving the actual development of field data to the Corps of Engineers of the Department of the Army and restricting itself to the interpretation of the field data as it affects the other responsibilities cited. The main, and constantly widening activity of the Administration in connection with development of the lake ports is in consulting with the various ports, at their specific request, in overall port planning, including design, location, and type of facilities and their supporting landside traffic networks, and all phases of port administration.

Involved are detailed consultation in the individual ports with port officials, analysis of traffic potential studies performed by the ports, by other government agencies such as the Corps of Engineers, or by private consultants, and formulation, in the light of analysis of traffic potential studies, of recommendations as to desirable aims in port development.

In certain directions, where there exists no detailed body of required knowledge, the Maritime Administration itself will undertake, or contract with private interests to undertake specialized research.

An example of this situation is the current study being produced for Maritime by an engineering consultant on the subject of roll-on roll-off and similar type terminals. Research of this nature is of definite bearing on the future development of the lake ports.

The present plan for roll-on-roll-off development is undergoing careful reevaluation in the light of the high costs of transporting low density cargoes. There is nothing wrong with the roll-on-roll-off concept. It presents a very realistic approach to the problem of merchandising, loading, vessel turnaround, and other aspects of cargo handling and service to shippers. However, the shipping industry is taking another more thorough and technical look at implications of this new type of ship which may have escaped analytic scrutiny in preliminary considerations.

Under the law, two major forms of subsidy to the American Merchant Marine are administered by the Maritime Administration:

1. Operating differential subsidy helps to put American shipping on a parity with lower cost foreign shipping.
2. Construction differential subsidy helps to assure the maintenance of an American

shipbuilding and ship repair industry through the use of government funds to overcome the advantages that lower material and labor costs give to foreign shipbuilding centers.

The major interest within the Federal Maritime Board and the Maritime Administration, of course, has been the determination that this route to the Northern European ports is "essential" to the commerce and defense of the United States within the meaning of our shipping laws. This action means that service on this route by qualified United States steamship companies is possible under a Federal operating-differential subsidy. Three companies, T. J. McCarthy, Isbrandtsen, and U. S. Lines, have applied for consideration for such a contract, and we should soon see considerable progress made by the FMB in considering these applications.

In addition, other U. S. flag lines are seriously considering the inauguration of services between the Great Lakes and other overseas areas such as the Caribbean, the Mediterranean, Africa and South America. The Maritime Administration at present is reviewing the many facts and factors involved in these trades that must be considered prior to any finding by the Administrator of the essentiality of each of these routes.

A vast potential of port facility construction, modification and modernization lies ahead for the Great Lakes. New Port Authorities are being formed, communities are awakening to the need of technical, administrative and political leadership in this connection. They are engaging consultants to examine present ports and facilities, to suggest new directions of effort, to delineate the roles to be played by new communities and the hinterlands served by new and old ports. In some cases solid starts have been made on construction of facilities geared to the new seaward look. Chicago, for instance, is building a 24 million dollar Lake Calumet development to meet the challenge of the Seaway.

There is another field of responsibility placed upon the Government agencies, and principally on the Federal Maritime Board, which your new role as world seaports makes of vital interest to you. The Federal Maritime Board is carefully weighing what steps it can and must take in the near future to start us along the difficult road of achieving greater clarity, greater uniformity in the practices, charges and costs of our great terminal operations on all Coasts. In regard to this responsibility Mr. Clarence G. Morse Chairman of the Federal Maritime Board reported:

In 1955, individual interests among the Atlantic port groups pointed out certain terminal problems they felt were handicapping operations. Opinion, although divided, reflected a general feeling that the FMB should step in and provide assistance. In December of last year, the Virginia State Ports Authority filed a petition requesting the Board to

enter into an investigation into the reasonableness and lawfulness of the practices and charges of all Atlantic and Gulf ports subject to the Board's jurisdiction.

A number of North Atlantic port interests supported the petition and endorsed the need for an investigation. Although some groups didn't think such an investigation was needed, a considerable proportion suggested that Atlantic and Gulf ports be given an opportunity to go into the matter with the Board's staff. As a result, the American Association of Port Authorities took the lead and arranged meetings with our staff people in Washington. Representatives of terminals from the Canadian to the Mexican borders attended. This was early in 1956.

The major problems stated were, briefly, dockage: The question of free dockage principally offered by rail-owned terminals was raised. A serious lack of uniformity in dockage charges was noted. The question of free time was discussed. There was a general feeling that rail-owned terminals in particular were often granting excessive free time.

Other individual problems were aired, involving wharfage paid by cargo interests for use of terminals. One of these was the apparently more favorable treatment given by rail-owned terminals to cargoes left by rail, as compared to that brought by truck. Throughout the discussions there was apparent a sharp lack of uniformity as to charges, terminology and practices with respect to wharfage and handling of cargoes.

Underlying and most important is the relationship of rail-owned and operated terminals versus other types of terminals. Likewise, the need was expressed for clarification of the jurisdiction of the Federal bodies themselves -- the Federal Maritime Board and the Interstate Commerce Commission. The courts in the Philadelphia Piers case clearly upheld the FMB's jurisdiction over rail-owned terminals, although they did not shed much light on the

line of demarkation between the jurisdiction of the two, largely because of the cloudy definition between rail operations and rail-owned terminal operations.

As a result, the Board's staff has been engaged in an exhaustive study to resolve the question of jurisdiction between the ICC and the FMB and has reviewed virtually all decisions of the two agencies and the courts relating to the question.

The staff has now completed its initial studies on this and other points, and is preparing a report and recommendation for the FMB's consideration.

There are many factors which will come under scrutiny. For one thing, the effect of the so-called Freas formula as applied to the Pacific ports should be considered, since this seems a very successful application of basic principles. Here we find a direct approach to the central question of who pays for what services -- it is an attempt to determine the proper share of costs to be borne by the ship and the cargo at the common meeting place -- the port terminal. It would seem, at this time, that this approach by the Pacific ports presents a good example of progress toward self-support by terminals.

In general, it would seem to be logical that some proper cost allocation or system be uniformly applied, and this may well come out of the studies now being made.

If the Federal Maritime Board does go into such an investigation it will be a strong move toward a constructive end carried on at the request of the terminal industry and port authorities themselves, with the principal aim of benefiting this essential American industry, which the Seaway development will make of such major importance to the Great Lakes.

The Federal Government, and the Great Lakes community, must keep in step, for today, the success of the merchant marine of the United States, which is equally dependent upon its floating equipment and its shoreside facilities, is our ultimate, mutual goal.

## FEDERAL POWER COMMISSION: HYDROELECTRIC POWER IN THE GREAT LAKES-ST. LAWRENCE BASIN

by Kenneth G. Tower  
Regional Engineer, Chicago Regional Office

The hydroelectric potential of the Great Lakes-St. Lawrence Basin constitutes an important source of electric energy. In this Basin are to be found some of the finest water-power sites in the world. Unquestionably, one of the most attractive of these sites lies in the Niagara River section. Here, within a few miles, is a total concentrated fall of about 325 feet, and a high river flow maintained with remarkable uniformity as a result of the regulatory effect of lakes Superior, Michigan, Huron, and Erie. Other outstanding sites are located in the several rapids sections of the St. Lawrence River and have the further benefit of the added regulatory effect of Lake Ontario. Here the heads to be developed are not so great as on the Niagara, but the sustained high flow of the river justifies large generating plants.

Water-power in the Great Lakes-St. Lawrence Basin falls topographically into four categories: (1) the streams tributary to the Lakes, (2) the inter-connecting channels of the Lakes, namely, the St. Marys River and the Niagara River, (3) the St. Lawrence River, and (4) the streams tributary to the St. Lawrence River.

A table showing the hydroelectric potentiality of watersheds of the eight States which drain into the Great Lakes accompanies this paper. It contains a quite detailed record of the hydroelectric power presently developed and an estimate of the total undeveloped power in the Lakes tributaries. I might add that the economic feasibility of undeveloped sites has not, in all cases, been established. It may well be, however, that some of these projects which may not be economically justified today would become so should the future costs of generating electric power by alternative means increase materially.

The accompanying table reveals that the hydroelectric power potential of streams tributary to the Great Lakes is substantial, with approximately 790,000 kilowatts of capacity already developed which is capable of producing about 3.35 billion kilowatt-hours of energy in an average water-year and about 880,000 kilowatts of capacity yet to be developed which would nearly double the average annual energy. Thus the estimated total potential of these streams, expressed in terms of electric power and energy, is 1,670,000 kilowatts of capacity with associated annual energy of about 6.4 billion kilowatt-hours.

As one moves downstream through the Great

Lakes and the St. Lawrence River, the first hydroelectric power developments to be seen are those on the St. Marys River, between Lake Superior and Lake Huron, where a fall provides a head of about 21 feet. In this reach the Corps of Engineers has constructed a power plant with an installation of 18,400 kilowatts, which is reported to have an average annual potential energy output of about 160 million kilowatt-hours. Provisions have been made for enlarging this plant to approximately 45,000 kilowatts should future conditions warrant the expansion. Except for a small amount of power used for operation of the locks at St. Marys Falls, all of the energy developed at the Corps' plant is sold to a public utility for commercial distribution.

The Carbide Power Company, formerly the Michigan Northern Power Company, also utilizes the fall between the Lakes for power purposes, and has in operation a plant with about 80 small units, which have an aggregate name-plate rating of about 44,000 kilowatts. The output of this plant is used in the adjoining property of the Union Carbide and Carbon Corporation, of which the Carbide Power Company is a subsidiary, in the manufacture of calcium carbide.

In the St. Clair and Detroit rivers channels which form the connecting link between Lake Huron and Lake Erie, the development of hydroelectric power would not be practical; however, when we come to the Niagara River interconnecting channel between Lakes Erie and Ontario, we arrive at the greatest single source of potential hydroelectric power on the North American continent, if not in the world.

Prior to the destruction of the major portion of the Schoellkopf generating station in June of this year, the installed capacity in hydroelectric plants on the United States side of the Niagara River was 445,000 kilowatts, 365,000 kilowatts of which were at Schoellkopf and 80,000 at the Adams station. These plants together produced on the average about 3.7 billion kilowatt-hours of energy a year. As you no doubt are aware, the Schoellkopf station was put out of operation when a rock slide on June 7 destroyed the two sections known as Plants B and C and damaged the remaining section, Plant A. Thus, the only hydroelectric power now being generated in the Niagara River reach on the American side is that which is being produced by the old Adams plant. Recently, however, the Federal Power Commission has received

an application from the Niagara Mohawk Power Corporation, owners of the Schoellkopf and Adams stations, for amendment of their license to authorize rehabilitation of Plant A. Rehabilitation of this plant would restore about 104,000 kilowatts of capacity and nearly a billion kilowatt-hours of energy a year to the Niagara Mohawk system. This work is scheduled to be completed in the summer of 1957.

The Niagara Treaty of 1950 greatly improved the power development possibilities in the Niagara River section. By terms of this treaty the Governments of the United States and Canada agreed that all outflow from Lake Erie other than that required for domestic, sanitary, and navigation purposes, and for the scenic beauty of Niagara Falls, may be diverted for the generation of power. The treaty further provides that, except for the water diverted into the Great Lakes Basin by Canada through the Long Lac-Ogoki works, water made available for power shall be divided equally between the two countries. For preservation of the scenic beauty of the Falls, the treaty provides that the flow over them shall be no less than 100,000 cubic feet per second during daylight hours of the tourist season and no less than 50,000 cubic feet per second at any other time. By these provisions, the treaty makes available to the United States for power generation an average flow in excess of 60,000 cubic feet per second and to Canada an average flow in excess of 65,000 cubic feet per second.

Canada lost no time in taking advantage of the additional water which the 1950 Treaty made available for power and immediately began construction of the Sir Adam Beck No. 2 generating station at Queenston, Ontario. This plant has been in operation since 1954 and by the summer of 1955 had an installation of 900,000 kilowatts. Work is continuing toward the ultimate development of this plant, which in conjunction with a pumping-generating station, will increase the capacity on the Canadian side of the Niagara River by 1,370,000 kilowatts to a total installed capacity of 2,218,000 kilowatts.

Although plans for redevelopment on the American side have been proposed by several agencies, construction has been delayed by the reservation made by the Senate of the United States in ratifying the Treaty of 1950. This reservation requires that any project for redevelopment of the United States' share of the water for power purposes shall not be undertaken unless specifically authorized by Congress. Such authorization has not yet been granted.

As early as 1949 the Staff of the Federal Power Commission prepared a report presenting a general plan for redevelopment in which it was concluded that, consistent with preservation of the scenic beauty of the Falls, the American side could be redeveloped to increase the installed capacity from 445,000 to 1,695,000 kilowatts and the average annual energy from 3.7 to 11.6 billion kilowatt-hours. This plan assumed the Schoellkopf plant would con-

tinue in operation and the old Adams plant would be placed on a standby basis. The report of the Commission Staff served as one of the bases for the negotiation of the 1950 Treaty with Canada.

Since the negotiation of the Treaty, both public and private groups have prepared plans similar to that of the Commission Staff. One of these has recently been submitted by the Power Authority of the State of New York to the Federal Power Commission in the form of an application for a license for development of the Niagara River. The plan proposed by the Power Authority would utilize all the water made available to the United States for power generation by the 1950 Niagara Treaty, up to flows of 83,000 cubic feet per second. The plan in general is similar to other plans which have been prepared and, like them, includes a main generating station at the base of the cliff at Lewiston, New York, and a pumping-generating station on the escarpment above. The combined installations would have a capacity of 2,190,000 kilowatts, capable of producing about 13.0 billion kilowatt-hours of energy in a year of average water supply.

With the increased power diversions permissible under the 1950 Niagara Treaty, it became imperative to complete remedial works for the preservation and enhancement of Niagara Falls. Accordingly, the Governments of the United States and Canada requested the International Joint Commission to make recommendations concerning the nature and design of remedial works necessary to enhance the beauty of the Falls by distributing the water so as to provide an unbroken crestline. This was done, and the works recommended, consisting in part of a control structure of piers and gates, is now about 90 per cent completed. Nine of the thirteen gates are in operation. Completion of the entire structure, presently about two months ahead of schedule, is expected by the end of 1957. The cost of the work is to be divided equally between the two countries.

Downstream from Lake Ontario along the main stem of the St. Lawrence River, which carries the full outflow of the Great Lakes Basin, are a number of large hydroelectric projects existing, under construction, or in the planning stage. I shall, however, limit my remarks to the International Rapids section, in which the United States has an interest. Here in the reach between Ogdensburg and Massena, New York, under an Order of Approval issued by the International Joint Commission, the Power Authority of the State of New York, and The Hydro-Electric Power Commission of Ontario are jointly constructing facilities which will develop a head averaging more than 80 feet. The construction work by the Power Authority is being carried out under the provisions of a license issued to that agency by the Federal Power Commission in 1953. The principal structures featured in the international development are a control dam near Iroquois, Ontario; a spillway dam at the head of Barnhart Island in the

vicinity of Massena, New York; and two powerhouses forming a single unit at the foot of Barnhart Island. The American and Canadian powerhouses will each contain sixteen 57,000-kilowatt generating units, or a total name-plate capacity of 1,824,000 kilowatts. The estimated average annual output of these machines is about 13 billion kilowatt-hours.

Construction of the power project in the International Rapids section provides the pool which makes feasible the deep-draft St. Lawrence Seaway through this reach of the river. Furthermore, the control works near Iroquois will provide a means for regulating the levels of Lake Ontario to benefit owners of shore property around that lake. To accomplish this objective, the Governments of the United States and Canada have approved a plan submitted by the International Joint Commission to restrict lake levels to a range of four feet between the limits of elevations 244.0 and 248.0.

Finally, in addition to all of the foregoing, flowing into the international section of the St. Lawrence River are three streams which contribute substantially to the power produced in that area. These are the Raquette, the Grass, and the Oswegatchie rivers. At present, about 200,000 kilowatts of capacity have been developed in the basins of these streams, which are capable of furnishing about 1 1/4 billion kilowatt-hours of energy a year to the power supply. It is estimated that additional capacity approximating 380,000 kilowatts may be feasible of development at some future date which would add nearly another billion kilowatt-hours of energy a year to the supply of the area.

The total U. S. hydroelectric potential in the Great Lakes-St. Lawrence Basin can be summarized on a State basis as follows:

<u>States</u>	<u>Developed</u>	<u>Undeveloped</u>	<u>Total</u>
	- - - - 1,000 Kilowatts - - - -		
New York			
Lake tributaries	242	358	600
Niagara River	184*	2,006	2,190
International Rapids		912	912
St. Lawrence			
tributaries	200	380	580
Subtotal	626	3,656	4,282
Ohio tributaries	10		10
Indiana tributaries	14	8	22
Michigan tributaries	364	328	692
St. Marys River	63	27	90
Subtotal	427	355	782
Wisconsin tributaries	69	96	165
Minnesota tributaries	89	93	182
TOTAL	1,235	4,208	5,443

\*Assuming 104,000 kilowatts restored at Schoellkopf Plant.

With the completion of the St. Lawrence Project in 1959 and redevelopment of the Niagara River, the Great Lakes-St. Lawrence Basin will have installed hydroelectric generating capacity equal to about one-sixth of the total hydroelectric capacity presently in service in the United States. Furthermore, the total hydroelectric potential of the Great Lakes drainage area in the United States comprises about one-half the total hydroelectric potential of the entire area of the eight States involved. It is therefore apparent that this hydroelectric power potential, both developed and undeveloped, is an important asset--a natural resource which you gentlemen, representing your States on this Great Lakes Commission, will wish to keep constantly in mind and accord every due consideration in your deliberations.



# DEVELOPED AND UNDEVELOPED HYDROELECTRIC POWER IN THE UNITED STATES IN BASINS TRIBUTARY TO THE GREAT LAKES

September 1, 1956

River Basin	Generating Capacity - kw		Avg. Annual Generation - 1000 kwh		
	Developed	Undeveloped	Total Potential	Developed	Undeveloped
GRAND TOTAL	787,935	883,970	1,671,905	3,349,980	3,073,080
NEW YORK					
Lake Ontario					
Black	97,315	118,830	216,145	500,900	569,000
Salmon	31,450	46,380	77,830	103,000	46,380
Oswego	56,822	1,400	58,222	256,880	4,000
Salmon Creek	250	0	250	300	0
Genesee	48,190	141,060	189,250	200,500	456,000
Oak Orchard Creek	6,800	2,400	9,200	26,300	0
18-Mile Creek	1,000	0	1,000	2,300	0
Sub-total	241,827	310,070	551,897	1,090,180	1,075,380
Lake Erie					
Cattaraugus	500	0	500	2,000	0
Chautauqua Creek	0	48,000	48,000	0	108,000
Sub-total	500	48,000	48,500	2,000	108,000
TOTAL, NEW YORK	242,327	358,070	600,397	1,092,180	1,183,380
OHIO					
Lake Erie					
Cuyahoga	2,099	0	2,099	7,800	0
Sandusky	3,000	0	3,000	5,000	0
Maumee	5,000	0	5,000	8,800	0
Sub-total	10,099	0	10,099	21,600	0
TOTAL, OHIO	10,099	0	10,099	21,600	0

River Basin	Generating Capacity - kw			Avg. Annual Generation - 1000 kwh		
	Developed	Undeveloped	Total Potential	Developed	Undeveloped	Total Potential
<b>MICHIGAN</b>						
Lake Erie						
Raisin	390	0	390	2,000	0	2,000
Huron	10,015	0	10,015	33,600	0	33,600
Sub-total						
Lake Erie	10,405	0	10,405	35,600	0	35,600
Lake Huron						
Saginaw	14,910	0	14,910	30,800	0	30,800
Au Sable	41,000	56,700	97,700	139,000	156,900	295,900
Thunder Bay	7,225	0	7,225	21,700	0	21,700
Cheboygan	4,360	0	4,360	15,300	0	15,300
Sub-total						
Lake Huron	67,495	56,700	124,195	206,800	156,900	363,700
Lake Michigan						
Cedar-Boyne	2,720	0	2,720	7,100	0	7,100
Boardman	4,330	0	4,330	13,500	0	13,500
Betsie	600	0	600	3,000	0	3,000
Manistee	38,000	89,600	127,600	99,000	215,100	314,100
Pentwater	250	0	250	1,000	0	1,000
Muskegon	48,430	31,000	79,430	164,100	86,900	251,000
Grand	14,960	18,700	33,660	52,600	78,400	131,000
Kalamazoo	7,913	2,200	10,113	36,000	11,600	47,600
St. Joseph	19,336	7,200	26,536	79,100	29,400	108,500
Menominee	96,965	36,650	133,615	485,100	164,000	649,100
Escanaba	12,200	0	12,200	42,400	0	42,400
Manistique	1,000	0	1,000	1,300	0	1,300
Sub-total						
Lake Michigan	246,704	185,350	432,054	984,200	585,400	1,569,600

River Basin	Generating Capacity - kw			Avg. Annual Generation - 1000 kwh		
	Developed	Undeveloped	Total Potential	Developed	Undeveloped	Total Potential
Lake Superior						
Tahquamenon		4,500	4,500	0	30,000	30,000
Au Train	896	0	896	4,700	0	4,700
Carp	4,480	0	4,480	19,000	0	19,000
Dead	17,300	0	17,300	81,600	0	81,600
Falls	100	0	100	500	0	500
Sturgeon	2,200	45,900	48,100	9,500	55,100	64,600
Ontonagon	12,000	27,000	39,000	68,000	126,400	194,400
Montreal	2,570	8,600	11,170	18,200	40,800	59,000
Sub-total						
Lake Superior	39,546	86,000	125,546	201,500	252,300	453,800
TOTAL, MICHIGAN	364,150	328,050	692,200	1,428,100	994,600	2,422,700
<u>INDIANA</u>						
Lake Michigan						
St. Joseph	13,735	8,000	21,735	47,100	36,000	83,100
TOTAL, INDIANA	13,735	8,000	21,735	47,100	36,000	83,100
<u>WISCONSIN</u>						
Lake Michigan						
Milwaukee	175	0	175	200	0	200
Fox	30,323	45,200	75,523	170,100	149,600	319,700
Oconto	3,450	4,500	7,950	11,900	22,600	34,500
Peshigo	22,724	17,200	39,924	75,000	78,700	153,700
Menominee	9,135	16,450	25,585	59,700	66,000	125,700
Sub-total						
Lake Michigan	65,807	83,350	149,157	316,900	316,900	633,800
Lake Superior						
Montreal	0	3,100	3,100	0	15,200	15,200
Bad	1,450	7,800	9,250	6,300	43,000	49,300
Iron	800	0	800	3,000	0	3,000
Brule	0	2,300	2,300	0	16,000	16,000
Eau Claire	707	0	707	2,300	0	2,300
Sub-total						
Lake Superior	2,957	13,200	16,157	11,600	74,200	85,800
TOTAL, WISCONSIN	68,764	96,550	165,314	328,500	391,100	719,600

River Basin	Generating Capacity - kw		Avg. Annual Generation - 1000 kwh	
	Developed	Undeveloped	Developed	Potential
<b>MINNESOTA</b>				
Lake Superior				
St. Louis	88,860	10,000	432,500	57,000
Gooseberry	0	1,200	0	4,000
Beaver Bay	0	2,500	0	15,000
Baptism	0	11,400	0	60,000
Poplar	0	11,900	0	64,000
Cascade	0	5,600	0	26,800
Devil Track	0	5,500	0	24,700
Brule	0	20,300	0	109,400
Pigeon	0	24,900	0	107,100
<b>TOTAL, MINNESOTA</b>	<b>88,860</b>	<b>93,300</b>	<b>432,500</b>	<b>468,000</b>
				<b>900,500</b>

1/ The existing Waterport plant has additional capacity (2400 kw) undeveloped at the site, but no incremental generation.

## GREAT LAKES HARBORS ASSOCIATION: ITS DEVELOPMENT AND ACTIVITIES

by John C. Beukema, President

It is a pleasure and a privilege to meet with the officers and members of Great Lakes Commission. Your Commission, if I am correctly informed, is a federation of state agencies created in the several Great Lakes states for the express purpose of resolving certain problems of mutual interest to the inhabitants of these states, and of securing concerted action on these problems.

It has sometimes been referred to in the press as a new development in the relationship between these states. May I point out, however, that like everything else under the sun it has an archetype in the form of the Great Lakes-St. Lawrence Tidewater Association which did such yeoman work in the early days of the St. Lawrence Seaway and Power project. It expired about 1934 or 1935, after the 1932 treaty with Canada on this project had failed of approval in the U.S. Senate. This too was a state supported organization for which each of the several legislatures made an annual appropriation. Michigan, Wisconsin, and Minnesota, I believe, contributed in the neighborhood of \$10,000 a year for many years during the '20's. The parallel is not exact, but there are sufficient points of similarity to make the comparison interesting.

The Great Lakes Harbors Association made an incidental contribution toward the organization of this Commission. In 1951 our general counsel, Herbert H. Naujoks, who is also counsel for the Great Lakes states on the Chicago Water Diversion issue, wrote a treatise on "Compacts and Agreements between States and between States and a Foreign Power." It was printed in the Marquette Law Review for the winter of 1952-53 (Vol. 36, No. 3). I shall be glad to supply any interested member of the commission with a copy. Mr. Naujoks briefs the genesis and history of such compacts, beginning with boundary disputes in colonial days and the two methods employed to settle them. He calls attention to the provision in the Articles of Confederation between the original thirteen States, and finally, to the construction of Article I, section 10, Clause 3, of the federal constitution.

I am asked to tell you about the Great Lakes Harbors Association; its form of organization; its aims, purposes, and functions; its history; and its current projects.

Most organizations are born out of crisis or necessity. The Great Lakes Harbors Association is no exception. Chicago had been taking some

10,000 cubic second feet of water out of Lake Michigan and diverting it down the Chicago drainage canal for several years in the early part of this century. Many of the Great Lakes ports and states felt that their navigation interests were adversely affected. Individual protests proving unavailing, several conferences were called, largely at the insistence of Milwaukee. As a net result, an Association was organized to promote joint action on a state level. The ultimate result, as you all know, was a proceeding before the United States Supreme Court which handed down a decision in 1930 sustaining the Lake States and limiting the amount of water that could be diverted from Lake Michigan.

The exact year when the Association was formed is somewhat in doubt in view of the fact that there were several meetings with a more or less informal organization. The generally accepted date is 1921. The Association has therefore had 35 years of continuous existence.

Chicago Water Diversion was the original issue that welded the port cities of the Great Lakes together. But a second issue, the St. Lawrence Seaway and Power Project, soon began to command equal attention.

Opening the Great Lakes to ocean-going vessels had been a matter of interest in the Great Lakes states and eastern Canada since September, 1895, when the International Deep Waterways Association met in Cleveland and importuned the governments of both countries to name a Deep Waterways Commission to study the subject. The Boundary Waters Treaty of 1909 reaffirmed the provisions of the 1870 treaty between the United States and Great Britain, representing the Dominion of Canada, expressly providing that navigable boundary waters should forever continue free and open to the ships of both countries, without discrimination. It further established the International Joint Commission, under whose auspices further engineering studies were made during the next decade.

Organization of the Great Lakes-St. Lawrence Tidewater Association under the energetic leadership of the late Charles P. Craig and the Hoover report of the late 20's roused interest to fever heat and resulted in the signing of a treaty with Canada on July 12, 1932. The Great Lakes Harbors Association was an active agent in the effort to secure approval of this treaty by the Senate. In fact, Mayor Daniel W. Hoan of Milwaukee, its vice-president, and your speaker spent much of the winter of '32-'33

in Washington gathering data for the proponents. When the treaty failed, the Tidewater Association gradually declined in influence, to be succeeded in 1935 by the National Seaway Council, organized at Detroit by Great Lakes Harbors Association, New York Power Authority, Champlain Valley Council, Northern Federation of New York, Lake Erie Ports Association and West Michigan Legislative Council.

The latter organization, supported by such moneys as these associations were able to raise in the depression period, promoted the Executive Agreement of 1941, debated in Congress for over a decade, and finally abrogated by Canada on the eve of the election in 1952.

During the first ten or fifteen years of its existence the Association had both an American and a Canadian section, and the annual meeting rotated between the two countries. In time it became apparent, however, that most of its activities centered in the Congress of the United States and in the U. S. Supreme Court. Canadian participation proved an embarrassment to cities like Toronto, Hamilton, Windsor and others, and eventually the Canadian contingent withdrew from active participation, although retaining a sympathetic interest in the Association's work along the lines of its two major objectives.

Currently the Association has a membership of some 41 port cities, Chambers of Commerce and others, with 33 municipal governments represented. We are, therefore, primarily an organization of lake port municipalities.

The purposes of the Association, as set forth in Article II of its constitution, are as follows:

1. To promote the efficiency of the several lake harbors, their development along physical and administrative lines, and to assist them in the solution of their problems.
2. To restore, preserve, and protect the waters of the Great Lakes at their normal levels.
3. To encourage the furtherance of the waterway projects designed to connect the Great Lakes with the Atlantic Ocean and the Gulf of Mexico.
4. To collect and distribute information of educational and economic value to the Association members and to the public in general.
5. To develop markets for the natural resources, agricultural and manufactures products of the Middle West and to promote commerce between the Great Lakes ports and domestic and foreign ports.
6. To encourage and promote the orderly development of increased waterborne commerce on the Great Lakes through the deepening of connecting channels and harbors and the proper maintenance of same.
7. To cooperate with municipal, state, and

federal agencies in projects that will benefit waterborne commerce on the Great Lakes.

8. To promote the advancement of commerce on the Great Lakes through increased efficiency in port facilities and a better coordination of water, rail, truck and air transportation.
9. To develop good relations with the lake port cities of Canada and to promote increased tonnage between the ports of Canada and the United States.

It will be noted that one of the Association's objectives (sub-section 3) is to "connect the Great Lakes with the Atlantic ocean and the Gulf of Mexico."

The Seaway, as we view it, is the northern half of a great natural waterway extending from Newfoundland to New Orleans, with Chicago interchange between deep-draft vessel and barge. This viewpoint was reiterated in testimony presented by the Association's president before the U. S. Army division engineer at hearings on the deepening of Great Lakes harbors held at Detroit October 16, 1956. We visualize movements of cotton from Memphis to Toronto and Montreal, grain from Kansas City and Omaha loaded on deep-draft vessels at Chicago or Milwaukee, Philippine and Hawaiian sugar moving through the Panama Canal to New Orleans, thence by barge to Upper Lakes ports, petroleum and petroleum products to Great Lakes ports and refineries, etc.

The Association does not believe, however, that additional water from Lake Michigan will have any beneficial effect on channels in the Mississippi River between St. Louis and Cairo, where there are shoals. In this respect it relies on the testimony of Lieutenant General Bixby, former chief of Army engineers, who testified before the Master in Chancery named by U. S. Supreme Court that such diversion would have a negligible effect. Furthermore, it opposed that Jonas Bill authorizing additional diversion on the ground that the Supreme Court assumed jurisdiction in its 1930 decision and has indicated that if relief is needed, the proper procedure is a request to the court for the appointment of a master in chancery who shall take testimony for presentation to the court. In other words, we don't want diversion to be made a political football. Accordingly our general counsel wired the President on October 18, 1956 as follows: "Press dispatches disclose Mayor Daley and Governor Stratton urge immediate increase in diversion of lake water at Chicago. Great Lakes Harbors Association opposes any increase in diversion above amount fixed by Supreme Court decree for reason that water levels in canalized Illinois waterway are normal while water in Mississippi River below Alton cannot be restored to normal by any amount of additional diversion. Testimony before Special Master Hughes including that of late General Bixby conclusively proves in-

creased diversion would have negligible effect on navigable depths of Mississippi River. Since oil companies need help we suggest construction of pipe line in affected areas. This can be done at a minimum cost in a week."

On October 31, 1956 Colonel George E. Pickett, Chief, Operations Division, Civil Works, wrote us as follows:

"In view of the decree of the Supreme court dated 21 April 1930 restricting the diversion of water from Lake Michigan to 1,500 second feet plus domestic pumpage and retaining jurisdiction 'for the purpose of any orders or direction, or modification of this decree, which it may deem at any time to be proper in relation to the subject matter under controversy' no authority is known to exist under which any change in the amount of diversion could be permitted by this department contrary to said decree.

"The low water condition in the Mississippi River is considered to be serious and all practical steps are being taken to alleviate the condition by co-ordinated and basin-wide regulation of all available waters in the Mississippi-Missouri River system.

"Your suggestion that the oil companies construct pipe lines in the affected areas is noted. Such construction of course, is for decision by the oil companies concerned."

The Association has been represented at every public hearing on Connecting Channels in the Great Lakes, urging the deepening of such channels. It was represented in the initial hearing on the third phase of the Seaway development, namely the deepening of harbors, which was held in Detroit October 16, 1956. It will present further testimony at subsequent hearings dealing with specific ports.

When the Interstate Commerce Commission issued Service Order 914 last June, limiting free time on cars carrying export freight at lake ports to two days, whereas cars at all ocean and Gulf ports, under Service Order 912, have six days, the Association was the first organization to protest. It called the attention of its member cities and Michigan and Wisconsin representatives in Congress to the situation with the net result that formal proceedings for cancellation of the order were instituted by those interested and having standing before the Commission. Senator Potter of Michigan introduced a bill requiring parity of treatment in the closing days of the congressional session. The bill will probably be re-introduced in the next Congress.

We have urged the Corps of Engineers and Congress to institute a change in the policy on improvement and maintenance of small non-commercial harbors, or recreational ports. The Corps has developed a formula for determining which harbors are eligible for assistance. We have advised the proper officials at several ports how to proceed in the premises. Two of them, Pentwater and Saugatuck, have secured much needed improvements during the past year.

The Association vigorously opposed the proposal

to impose tolls on Great Lakes connecting channels.

Testimony was presented before a sub-committee of the U. S. Senate Foreign Relations committee at Chicago August 30, 1956 on several subjects. We urged:

1. That hearings on deeper harbors be expedited and a report submitted by the Corps of Engineers to the next Congress.
2. That a new survey be made of present and potential commerce on the St. Lawrence River in the light of changed conditions. (It is our understanding that the St. Lawrence Seaway Development Corporation contemplates revising its original survey.)
3. That no action be taken on tolls on the Seaway until public hearings are held.
4. That additional essential trade routes be designated from the Great Lakes region to European and Caribbean ports by the Federal Maritime Administration. (The subject is now under study by the Administration.)
5. That parity of treatment between ocean ports and lake ports be made mandatory.

The Association is keenly aware that we have a long hard fight ahead of us to build the new commerce on the Seaway. Habits of trade are hard to break, and the eastern seaports, the eastern railroads and the North Atlantic Conference lines will make every effort to hold what they have. A structure of export rates through lake ports must be built up. European governmental agencies, concerned with dollar earnings, who have a big voice in shipping policies, must be converted to the new route. Export-import agencies must be established in the principal port cities of the Great Lakes region. Banks must be educated and persuaded to establish export departments with specialists in charge.

On the physical side, we need public and private port development, and the construction of properly mechanized docks, wharves, etc. All of these must necessarily be related to the immediate and prospective commerce of the port. A vast amount of promotional work must be done, not only in the hinterland but in foreign markets as well, for our port facilities are a closed book to most Europeans and South Americans. We have to educate not only our own people, but those abroad. It's a ten or fifteen year job.

In all of this the Association proposes to take an aggressive part. Its function today is to point to the character and type of job to be done, and this we are doing through numerous appearances, not only before public bodies, but before chambers of commerce, luncheon clubs, and trade groups. We maintain a speakers bureau, largely staffed by our officers and directors, for this purpose.

From the foregoing it will be apparent that your Commission and our Association have much in common and should work together in closest harmony. I'm sure that is our purpose and intent.

## LAKE CARRIERS' ASSOCIATION: OBJECTIVES AND PROGRAMS

by Oliver T. Burnham, Vice President

Lake Carriers' Association is most appreciative of the opportunity to report to members of the Great Lakes Commission some of its objectives and programs together with its opinions relating to subjects of broad general interest. The availability of this forum for discussion of subjects having concern to states surrounding the Great Lakes offers a fortunate opportunity for the exposition and correlation of views by those having a common goal - the development and expansion of the Great Lakes area.

Our Association has been active in furthering the interests of Great Lakes transportation and thereby aiding in quickening the pulse of industrial expansion in the midwest area for more than three-quarters of a century. As a matter of fact when the centennial of St. Marys Falls Canal and the completion of a century of interlake shipping were recognized with attendant publicity in 1955, our organization was commemorating its 75th year. Consequently, this Association has the benefit of the experience and thought which have been helpful in achieving the current status of the Great Lakes as the greatest avenue of water transportation among the world's inland waterway systems.

Over the years we have maintained lightships, buoys, and other aids to navigation until such needed facilities could be joined in the present-day governmental system supervised by the U. S. Coast Guard. We have been in the forefront sponsoring measures designed to enhance the safety of navigation and the well-being of men employed on the ships.

As examples, many years ago, the Association's members voluntarily placed in effect a system of load lines so that the ships would not be laden too deeply for safety. Statutory requirement for such restrictions did not come until 1936. Separate navigating lanes were plotted and have been made effective on all of the Great Lakes. The purpose of this planning was, and is, to avoid, as far as possible, the collision of vessels proceeding in opposite directions.

The initial courses were established in 1912 and are still maintained on a voluntary basis with vessel operators of both the United States and Canada joining in the observance of this traffic control program.

Right here let me say that the principal violators of the separate courses are foreign vessels entering the lakes in connection with the trans-Atlantic trade. Although operators of all the liner services have been provided with copies of the separate course specifications, adherence by their masters has been sporadic and uncertain. To remedy this situation and the more

serious problems which are envisaged upon completion of the St. Lawrence Seaway, our Association and its Canadian counterpart, the Dominion Marine Association, are urging upon the federal governments the establishment of an International Pilotage Convention which will assure the presence of competent navigating officers, who are familiar with the Great Lakes pilot rules and procedures, on vessels entering the lakes.

One of the reasons for the vast expansion in Great Lakes commerce has been the deepening of channels connecting the several lakes, principally the Detroit, St. Clair and St. Marys Rivers. In 1912 the limiting draft in the Detroit River was 19 feet 5 inches. During that year the federal government commenced a project designed to afford a depth of 25 feet in all of the channels leading from Lake Superior to Lake Erie. This program was one for long-term development inasmuch as the desired depth in the Detroit River was not achieved until 1936. At that time the deepened waterway, named the Livingstone Channel in honor of our Association's president during the period 1902-1925, was opened for traffic. The importance of these deeper channels was vividly portrayed during World War II when the lake fleet handled nearly a billion tons of traffic or approximately four times the cargo transported by ocean vessels to and from all United States seacoast ports in the same period.

Thus far I have mentioned some of our accomplishments in the economic phases of the industry. Equally important, however, have been the programs designed to enhance the well-being of vessel officers and crews. Since 1909 one of the Association's committees has been actively engaged in providing and administering a variety of enterprises in this field. For more than forty years committees of crew members, known as ship safety committees, have been active in analyzing personnel hazards, suggesting remedies and generally pioneering in the education of their fellow crew members toward safer working practices. Many worthwhile suggestions have emanated from these committees and been incorporated in subsequent bulletins. Incidentally, many of you are familiar with the major impact which the National Safety Council has had upon safety mindedness in industry. The Marine Section of that organization was the brain child of one of the Association's officers many years ago.

Shipping as an industry has long been closely supervised by governmental agencies. For instance, no man may become a vessel officer unless he has



served a specified number of years in subordinate positions and successfully passed detailed examinations administered by the U. S. Coast Guard and designed to determine his professional fitness. To aid qualified vessel personnel in securing advancement, the Association has maintained an educational program each winter since 1916. Its effectiveness is indicated by the fact that more than three-quarters of the present officers on Great Lakes vessels have attended its sessions and benefited by the knowledge thereby attained. In normal years, more than 200 men attend the full-time school classes which are convened during the period January 1 - March 1. The scope of this program has been further attested to by recognition on the part of the Veterans Administration in approving it for G. I. training.

In more technical phases of lake navigation, the Association was active in developing the system of radiotelephone communication which is now universal on Great Lakes vessels. It sponsored federal legislation which gave recognition to this mode of communication and was active in gaining the effectuation of the treaty between the United States and Canada designating radio-telephony as the recognized means of communication for safety and distress messages to and from all vessels on the Great Lakes. With the advent of radar for commercial use, at termination of World War II, our Association, through its consulting engineers, prepared plans and specifications for marine radar particularly suited to Great Lakes conditions. Principal electronics manufacturers then took over with the result that the Great Lakes fleet is now entirely equipped with this advanced navigational instrument.

I have mentioned some of our programs and accomplishments of the past so that you will recognize the broad perspective which the lake industry undertakes to achieve.

Among problems which the Great Lakes Commission will consider are the diversion of water from the Great Lakes, the abatement of excessive smoke, changes which may be anticipated with completion of the St. Lawrence Seaway, the provision of deeper channels in the rivers connecting the various lakes, expanding industrialization of midwest America and the building of effective programs designed to afford maximum recreational use of the lakes without impinging upon the utilization of the inland seas for the transportation of industrial raw materials and finished products.

I believe that the Association's views with respect to the diversion of water are well known. We believe that increased unnatural siphoning from the Great Lakes watershed has serious long-term implications to all of the lake states as well as to the Great Lakes fleet. Further than that, such diversion would have the effect of violating long-standing treaties between the United States and Canada. Our opposition has been forthright and continuous in the past and there is no expectation

that these views will be subject to reappraisal. Adequate water depths are the breath of life to Great Lakes ships. With each inch of lessened draft representing the loss of 1.5 million tons of cargo per season and with 45 vessels in the fleet which thus far have never been able to load to capacity, the case for additional diversion has only bleak implications so far as we are concerned.

Another issue which has attracted broad interest and concern at local, state and international levels is the problem of smoke abatement. With the increasing awareness of municipalities concerning the unpleasant aspects of excessive smoke emission by industrial establishments, railroads and ships, there has been expanded effort in recent years looking toward remedying this situation. Our Association, in cooperation with coal industry groups, has actively undertaken research looking for means of minimizing excessive smoke production by Great Lakes vessels when navigating through heavily populated areas. I think the acid test of our interest in meeting this problem head on is the fact that during the past six years our Association has allocated and expended \$20,500.00 as our participation in the Great Lakes Air Pollution Abatement Program. That organization, GLAPAP as it is called, has undertaken to determine the causes of excessive smoking by vessel power plants using coal as fuel and to devise methods for minimizing such emissions.

At one stage of these studies, Battelle Memorial Institute was retained to undertake specific research. The effectiveness of these actions is shown in the recognition accorded by the International Joint Commission, composed of representatives of the United States and Canadian governments and which has held hearings and investigations relative to this situation. While the installation of mechanical firing equipment, such as stokers, has been helpful in solving one of the basic difficulties, a consistent educational program among ship engineers and firemen is believed to offer the best long-term answer so far as present vessels are concerned. Like any educational project, however, optimum results are not obtainable in a short period.

At the present time another major development which we have urged is getting under way. Plans have been completed and bids are being received for further deepening of connecting channels in the Detroit, St. Clair and St. Marys Rivers. Completion of this project, scheduled for 1962, will provide a maximum depth of 27 feet and a safe navigating draft of 25.5 feet at low water datum. The program is estimated to cost about \$150,000,000.

Deepening of the connecting channels will require that existing harbor depths be increased if lake ports are to benefit from the added transportation capacity of the ships. To assess the problems involved and the relative need for such improvements, the Corps of Engineers, U.S. Army, has scheduled a series

of hearings to be convened at various lake cities during the current fall and winter. The initial discussion was held in Detroit on October 16th with others to follow in rapid succession commencing today. We, of course, favor such development of port areas where economic justification is present and look for assistance from the Great Lakes Commission and interested local groups.

Last year, in speaking at the annual meeting of the Great Lakes Harbors Association, I pointed out that regardless of the St. Lawrence Seaway, a major portion of lake commerce will continue to be in the basic bulk freight commodities -- iron ore, stone, coal and grain. I think it is important that you keep this fact in mind and that it be given adequate weight when plans for further harbor improvements in the lake area are being projected by municipal, state and regional authorities. Unquestionably, general cargo to and from overseas destinations will increase, but the life blood of lake commerce will continue to be in iron ore and the other basic raw materials and food stuffs which have caused the midwest to expand and prosper. Recent estimates of prospective St. Lawrence Seaway traffic emphasize this situation by forecasting that at least 80% of the tonnage will be in bulk commodities.

A major problem now confronting Great Lakes transportation interests relates to replacement of the present bulk freight fleet. In 1960, 62% of the bulk cargo vessels will be more than 50 years old. By today's standards, such ships are relatively obsolete and many of them should be replaced.

Great Lakes vessel people have always taken pride in the fact that private enterprise originally provided the lake fleet and has maintained it. That policy has continued through the decades. It has resulted in the construction of 30 vessels during the past seven years, at a total cost of more than \$150,000,000. The only governmental recognition of this achievement was the authorization to use emergency amortization and thereby recover a sizable portion of the construction costs during the initial five years of the vessels' useful lives. Now not even that option is available despite the continuing need for new ships and the increased costs involved in their construction. Furthermore, federal agencies concerned with shipping have not cooperated with the industry as was done during World War II. In that period, 39 old vessels were traded in as part payment toward the construction of 16 new ships.

In the last session of Congress, the Association sponsored legislation which would have permitted Great Lakes operators to trade in old vessels to the Federal Maritime Administration as part payment for the construction of new ships. This was not a novel procedure but one that has been effectively used by ocean operators for nearly 20 years. Likewise, the proposal was made that Great Lakes vessel owners be permitted to deposit a portion of their earnings in construction reserve funds for use in subsequent building of new ships. Here again no new theory was involved but only an option which has been available to ocean operators for a long period. Unfortunately, however, our proposals were criticized by the Federal Maritime Administration which, while it admitted the problem, offered no solution. Consequently, though the measure was passed by the U. S. Senate, it did not secure action in the House.

With present-day ship construction costs and the likelihood of additional competition in the traffic between Canada and the United States subsequent to completion of the St. Lawrence Seaway, a grave situation confronts our industry which should cause somber reflection by all of those who depend upon lake transportation as one of the essential services which support industrial life. In the trade with Canada, participation of United States vessels has plummeted from 76% in 1925 to 29% in 1955 even though the volume of that tonnage has tripled during the intervening period. While the actual prosecution of legislative and administrative solutions to our dilemma must necessarily rest with the industry itself, there are areas of approach in which members of the Great Lakes Commission can be most helpful. I refer specifically to the liaison which exists between state governments and members of the National Congress.

To summarize my comments, our Association and its members continue to stress, as long-term objectives, programs which will maintain and improve the low cost transportation service which is provided by Great Lakes freight vessels to the basic industries of the midwest region. We believe that an industry which is operated efficiently, recognizes the public interest and undertakes to build for the future, merits cooperation by those who administer and shape that public interest so there may be greater prosperity and benefit for all.

## METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO: ADDITIONAL DIVERSION OF WATER FROM LAKE MICHIGAN

by H. P. Ramey, Chief Engineer

The Sanitary District has sought additional diversion of water from Lake Michigan to provide a clean stream and decent conditions for navigation in the upper reaches of the Illinois Waterway; in particular, from Chicago to the Brandon Road pool just below Joliet. If proper conditions can be maintained in this critical reach, the conditions further downstream will assuredly be good, since the quality of the water improves as it flows on, below Brandon Road.

The Sanitary District, as such, has no particular obligation in this respect, as these channels in question have, since 1930, been taken over by the Federal Government and operated as a part of the Federal waterway, from Lake Michigan to the Gulf of Mexico. The Sanitary District has, since 1950, provided complete treatment for all of its sewage; and has thus done all that can be expected of any municipal organization. It has complied with all the requirements of the Supreme Court decree of April 21, 1930, in the Lake States case. Its major sewage treatment plant, the West-Southwest plant, was named, October 1955, by the American Society of Civil Engineers as one of the Seven Modern Engineering Wonders of the United States.

These channels, however, down into the Brandon Road pool, of the Illinois Waterway, were constructed by The Sanitary District of Chicago; and what happens in them has been in the past, and will be for some years yet to come, connected in the public mind with the Sanitary District. Hence, it is still the duty of the Sanitary District, as the most logical public agency, to use its best efforts to improve sanitary conditions in this Federal waterway.

The importance of this waterway, as an artery of commerce, can be seen from the steady increase in freight traffic through it, as follows:

1936	2,171,374 short tons
1942	6,790,041 " "
1948	12,272,945 " "
1953	20,077,414 " "
1954	19,311,422 " "
1955	21,362,852 " "

The simplest way to state the sanitary problem, is to consider the amount of water needed to properly dispose of sewage by dilution. The ration specified by the Illinois Legislature, in the Sanitary District Act, May 1889, small by present day standards, was 3-1/3 cubic feet per second of water for the sewage of 1,000 people.

The highest degree of sewage interception and

treatment, on an annual average basis, which can be expected from the Sanitary District plants, or from any plants, is 90 per cent. The population of the Sanitary District (1955) was 4,500,000, and industrial wastes were equivalent to the sewage of 3,800,000 people, total 8,300,000. With 90 per cent removal of bio-chemical oxygen demand, there still remains 10 per cent of the B.O.D.; and 10 per cent of 8,300,000 is 830,000. This remaining B.O.D. is equivalent to that from the sewage of 830,000 people. The presently authorized diversion of 1,500 cfs, annual average, provides a dilution ratio of 1,500 cfs for the equivalent of the sewage of 830,000 people, or 1.8 cubic feet per second of water for the sewage of 1,000 people. This is only about half of the dilution ratio specified in the Sanitary District Act; and is not enough to prevent nuisance conditions in the stream.

Another approach is in the matter of solids. In 1955 the solids, in the sewage reaching the treatment plants of the Sanitary District, averaged 867 tons per day. With 90 per cent removal of sewage solids, there still remains, in the treated sewage, about 87 tons per day of solids, which contain about 5 tons per day of nitrogen. An additional 40 tons per day of nitrogen is carried to the canal in the treated sewage effluent. This nitrogen promotes under-water growths, which will in time cause nuisance, and probably actual obstructions.

### Diversion for Chicago River

The present 1,500 cfs, annual average, diversion specified in the April 21, 1930 decree of the Supreme Court, and authorized in the June 26, 1930 permit from the Secretary of War, is the amount of water found by Special Master Charles Evans Hughes (Report December 17, 1929) "to be necessary for the purpose of maintaining navigation in the Chicago River, as a part of the Port of Chicago."

The Federal navigation project in the lower Illinois River, at that time, was a project, adopted by Congress January 21, 1927, based on an annual average diversion of 4,167 cfs. (House Doc. 4, 69th Congress, 1st Session). The State of Illinois was then building the Illinois Waterway, to connect the Federal navigation project in the Chicago River and Drainage Canal, with the Federal project then under construction in the lower Illinois River. For the legal reason that this Illinois Waterway was not a project which had been authorized by Congress, and

there was therefore no authorized connection between the two Federal projects, despite the fact that a physical connection was in the making, all testimony regarding the needs of the Illinois River was excluded from the case.

The needs of the Illinois River were not considered, even though General Jadwin, Chief of Engineers, and the Special Master's own witness, endeavored to testify about the project in the Illinois, then being constructed under his direction.

### Illinois Waterway

In less than three months, after the Supreme Court decree, or on July 3, 1930, Congress passed the Rivers and Harbors bill, under which \$7,500,000 was appropriated to complete the Illinois Waterway, and the project taken over by the Government as an authorized navigation project, and completed by the Army engineers, in accordance with Sen. Doc. 126, 71st Congress, 2nd Session.

This bill authorized the 1,500 cfs of diverted water, specified in the Supreme Court decree of April 21, 1930, to be used for the navigation of the Illinois Waterway. The bill provided further:

"That as soon as practicable after the Illinois waterway shall have been completed in accordance with this Act, the Secretary of War shall cause a study of the amount of water that will be required as an annual average flow to meet the needs of a commercially useful waterway as defined in said Senate document, and shall, on or before January 31, 1938, report to the Congress the results of such study with his recommendations as to the minimum amount of such flow that will be required annually to meet the needs of such waterway and that will not substantially injure the existing navigation on the Great Lakes to the end that Congress may take such action as it may deem advisable."

The Illinois Waterway was completed at Government expense by March 1, 1933 and officially opened June 22, 1933. The report on the water needed for the waterway was made September to December 1933 (House Document 184, 73rd Congress, 2nd Session). The report of the U. S. District Engineer, September 26, 1933, was reviewed by the Division Engineer October 19, 1933 and by the Board of Engineers for Rivers and Harbors November 13, 1933. It was approved in general by the Chief of Engineers December 6, 1933 and transmitted to Congress by the Secretary of War December 7, 1933.

The general conclusion of this report was that the diversion of 1,500 cfs, annual average, from the Lake Michigan watershed, in addition to domestic pumpage, was sufficient to meet the direct (flotation) needs of the waterway; but that the indirect needs, in the matter of securing satisfactory sanitary conditions for those aboard vessels or employed at

terminals could not be determined until after the waterway had been fully completed, the sewage treatment plants of the Sanitary District placed in full service, and the diversion limited to 1,500 cfs for a sufficient period of time (suggested as not more than two years) to observe the conditions as they might then exist.

A further conclusion in this report, by Col. Dan I. Sultan, 1933, was to the effect that the water authorized by the 1930 Act, for the Illinois Waterway, would result in a low water flow of 2,400 cfs in the Illinois River. The amount was inadequate to provide 9-ft. navigation in the lower Illinois River, then improved in accordance with the 1927 project, which required about 5,000 cfs, of diversion. Therefore, the complete canalization of the Illinois River was recommended, involving the removal of the Kampsville lock and dam, the rebuilding of the LaGrange lock and dam, the construction of a new lock and dam in the Illinois River near Peoria and a new lock and dam in the Mississippi River at Alton. This recommendation was adopted by Congress, August 30, 1935, and the existing improvement of the Illinois River has been constructed in accordance with that recommendation.

The report of Colonel Dan I. Sultan, September 20, 1933 (House Document 184, 73rd Congress, 2nd Session) sets forth specifically the need for more diversion, at least for temporary test purposes. This report contains the following language:

Page 51. "103. Effect of diversion upon navigation conditions on the Illinois River and Waterway. The determination by the Supreme Court of the amount of water to be diverted at Lockport was based upon the requirements of navigation in the port of Chicago and connecting channels. There is no difference between the requirements of navigation on the Illinois River and Waterway and those of navigation in the port of Chicago. Conditions of health, safety, and efficiency should be satisfactory for all. A reasonable standard of healthful and decent living conditions for those aboard ships and working at terminals on shore must be maintained. Injury to navigation may occur if putrefaction in the water results in nauseous or disgusting conditions. Such a condition may be caused by putrefaction of the effluent from the sewage treatment plants, putrefaction of raw sewage contained in storm-water run-off, and putrefaction from accumulated sludge deposits. The weight of expert testimony is to the effect that the effluent from the proposed activated sludge treatment plants will be inoffensive, but the sanitary district program of treatment is upon such an unprecedented scale that such predictions must contain some element of uncertainty. No reliable process of calculation can predict the effect of raw sewage in storm-water run-off and of accumulated sludge deposits.

After intensive and prolonged study, based upon the testimony of a number of eminent sanitary engineers, Special Master Hughes reached the conclusion that these matters were indeterminate, and that - 'provision should be made for further examination, after the sewage treatment plants have been completed, and the effect of the effluent therefrom with the storm-water flow on the navigable channels has been observed, to the end that the question of any further or other relief may have appropriate consideration in the light of actual conditions.'

"No one can predict with certainty the effect in 1939 of the reduction of diversion upon navigation below Lockport at any time prior to the completion of the sewage-treatment program. Sound procedure would be to carry out the full program of treatment plant construction, reduce diversion as required by the Supreme Court decree, and observe its effect. A period of not more than 2 years of observation and study after the completion of The Sanitary District of Chicago, and the full reduction of diversion to 1,500 cubic feet per second, should furnish conclusive data which will permit of positive determination whether any increase in diversion is necessary, and if so, by what amount."

Page 58. "142. The diversion from Lake Michigan prescribed by the Supreme Court, plus the pumpage, is sufficient for the operation of the locks and dams now in use between Lockport and Starved Rock, as well as for those proposed in this report.

"143. The program of construction of plants for complete sewage treatment should be carried out, diversion should be reduced as required by the Supreme Court decree, and navigation conditions along the waterway and river should be observed for a short period subsequent to January 1, 1939. Then, and then only, can it be determined with reasonable certainty whether any additional diversion is necessary in order to provide decent and healthful living conditions for boat crews and river terminal operators."

The report of General E. M. Markham, Chief of Engineers, in the same document, contains the following statement:

Page 6. "13. After due consideration of these reports, I concur in general in the views and recommendations of the Board. The report conclusively shows that aside from sanitary requirements, the minimum annual average flow from Lake Michigan required to meet the needs of a commercially useful waterway in the Illinois River, is a direct diversion of 1,500 cubic feet per second in addition to domestic pumpage by the City of Chicago. It does not appear possible to arrive at a conclusive determination whether

this flow will afford suitable sanitary conditions on the waterway after the sewage purification plants at Chicago have been completed and placed in operation. This flow will not substantially injure the existing navigation on the Great Lakes."

### Boundary Waters Treaty

It is the contention of the Sanitary District that Canada, having enjoyed the benefit of a diversion at Niagara Falls, for power purposes, of 16,000 cfs of water more than the amount assigned to the United States, from 1910 to 1950, should be foreclosed from any objection to more diversion from Lake Michigan at Chicago, even up to 10,000 cfs.

In the negotiations which led up to the 1909 Boundary Waters Treaty between the United States and Canada, ratified 1910, the International Waterways Commission made a special report, January 4, 1907, on the Chicago Drainage Canal. This report concluded with the following recommendation:

"A careful consideration of all the circumstances leads us to the conclusion that the diversion of 10,000 cubic feet per second through the Chicago River will, with proper treatment of the sewage from areas now sparsely occupied, provide for all the population which will ever be tributary to that river, and that the amount named will therefore suffice for the sanitary purposes of the city for all time. Incidentally, it will provide for the largest navigable waterway from Lake Michigan to the Mississippi River which has been considered by Congress.

"We therefore recommend that the Government of the United States prohibit the diversion of more than 10,000 cubic feet per second for the Chicago Drainage Canal."

The 1909 treaty provided that the United States might authorize the diversion of not more than 20,000 cfs and Canada not more than 36,000 cfs of water from the Niagara River above the Falls, for power purposes. When this treaty was under consideration by the Foreign Relations Committee of the Senate, Secretary of State, Elihu Root, explained this difference by stating that the treaty was not intended to cover Lake Michigan as a boundary water nor to affect the diversion through the Drainage Canal at Chicago, assumed to be 10,000 cfs in the treaty negotiations. This tacit agreement was ignored by Canada as early as 1912, when objections were made to increase in diversion beyond the then authorized 4,167 cfs.

The contention has been advanced that the above diversion of water, contemplated by the 1909 Boundary Waters Treaty between the United States and Canada, has been changed by the Treaty of February 29, 1950 with Canada, which later Treaty equally divides the water at Niagara Falls for power purposes.

Attention is directed to Article III of said 1950 Treaty, which specifically provides that the amount of water available for scenic or power purposes under Articles IV and V of the Treaty shall be the total flow from Lake Erie to the Welland Canal and the Niagara River (including the Black Rock Canal), "less the amount of water used and necessary for domestic and sanitary purposes and for the service of canals for the purposes of navigation . . . "

Such exempted diversion is therefore for the specific objectives of the presently desired additional diversion. So that regardless of whether or not the 1909 or 1950 Treaty with Canada prevails, the Congress has the power to authorize additional diversion, temporary or otherwise.

#### Lake Levels

A withdrawal of 10,000 cfs from Lake Michigan at Chicago would have an estimated lowering effect, after 5 to 8 years, of about 6 inches on Lakes Michigan and Huron, and 5 inches on Lakes Erie and Ontario. Such lowering can be figured only theoretically, because of the fluctuation of about 1 foot between the winter and summer levels of all the Great Lakes and the long time fluctuations of more than 5 feet in the annual average levels, all from natural causes.

The presently authorized diversion of 1,500 cfs of water, for the last 15 years, in effect since 1939, is estimated to have lowered the levels of Lake Michigan and Huron about 1 inch. The domestic water pumpage at Chicago, 1,708 cfs in 1954, has lowered such levels about 1-1/8 inches. Hence the present lowering effect is estimated at 2-1/8 inches. The proposed additional diversion of 1,000 cfs for three years is estimated would lower levels of Lake Michigan and Huron 5/8 inch, if continued indefinitely. The total estimated lowering effect of the three quantities would therefore amount to 2-3/4 inches on Lakes Michigan and Huron; and slightly less on Lakes Erie and Ontario.

The conclusions of the International Lake Ontario Board of Engineers Report to the International Joint Commission, June 14, 1955, on the "Effect on Lake Ontario levels of an increase of 1,000 cfs in the Diversion at Chicago, for a period of three (3) years," in part are as follows:

"24. The maximum temporary reduction in lake levels would be about 5/8 inch. It is considered that this reduction would have no significant effect on navigation.

"25. It is considered that the computed reductions in dependable capacity of 2,600 and 2,750 kilowatts at Niagara River plants in Canada and the United States respectively, and of 2,145 kilowatts at the Beauharnois plant, are of such temporary character and small magnitude that the provision of any replacement

capacity would not be justified . . . " (p. 11.)

Introduction of water into Lake Superior, from the Hudson Bay watershed, by Canadian interests, in amounts averaging more than 5,000 cfs, since July 1943, has raised levels of all the Great Lakes at least 3 inches. This has more than offset the lowering due to the diversion of water at Chicago; and will more than offset the prospective diversion of 1000 cfs more, sought in recent years.

In respect to these diversions from and into the Great Lakes system, the lake surface are fluctuating through their normal ranges, at levels slightly higher than their natural levels. Navigation interests receive the benefit of slightly greater depths thus created.

#### Illinois River Floods

The diversion of water from Lake Michigan now has no effect on flood water heights in the Illinois River. Since the Drainage Canal was opened, in 1900, floods from the Chicago area have passed into the Des Plaines and Illinois Rivers, instead of into Lake Michigan.

At times of heavy rainfall, the flood run-off from the Chicago area automatically replaced the diversion from the lake, even when the diversion was much greater than any figure now contemplated. Such flood water from Chicago, often much greater than the existing diversion, would affect flood heights in the Illinois River, to some extent.

The crest of a flood from the Chicago area has not, in the past 55 years, coincided with the crest of a flood from the streams tributary to the Illinois River. With a flood flow of 90,000 cfs to 100,000 cfs in the Illinois River, at Beardstown, a flood flow of 10,000 to 12,000 cfs from Chicago, lagging two to five days behind a flood from the local tributary streams, could not have any important effect on flood heights at that place.

Since Control Works, constructed by The Sanitary District of Chicago, have been operated at the mouth of the Chicago River (1939 and after), in conjunction with Control Works at the Calumet River, it has been possible to definitely exclude any water from Lake Michigan, in times of floods at Chicago. Shutting off the direct diversion, during and after heavy rains, has been and is routine procedure, under the direction of the United States District Engineer at Chicago.

No change has been made in the passage of local floods into the Des Plaines and Illinois Rivers, whether the diversion of water from Lake Michigan should be 1,500 cfs, 2,500 cfs, or even 10,000 cfs.

#### Temporary Increased Diversion for Navigation

There have been three occasions since April 21, 1930 when abnormal drafts of water have been required from Lake Michigan to aid navigation in

the Illinois and Mississippi Rivers. These were August 14 to September 18, 1930 (9,030 cubic feet per second); July 8 to August 7, 1936 (increase of 1,500 cfs over existing diversion); and January 25-27, 1944 (increase from 1,450 cfs to 5,000 cfs).

The increase in 1930 was due to low water in the Illinois River. The authorized diversion then was 6,500 cfs. The increase in 1936 was due to low water in the Mississippi River above the mouth of the Illinois. Greater depth was needed there to move certain boats during the construction of some of the locks and dams in the Mississippi. The authorized diversion at that time was 5,000 cfs, annual average. Both of the foregoing increases were before the complete canalization of the Illinois and upper Mississippi Rivers.

The increase in January 1944, from a budgeted diversion of 1,450 cubic feet per second to 5,000 cfs planned for twenty days, was to provide greater water depth in the Mississippi River at Chain of Rocks, to permit the passage of Naval craft to the Gulf of Mexico. The maintenance of sufficient depth at this place during a period of prolonged drought, September 1943 to January 1944, had used all the water available in the Mississippi River reservoirs and in the Fort Peck reservoir of the Missouri. It became necessary, in the words of the Acting Secretary of the Navy, "to continue the promotion of the war effort," and confirmed by the Secretary of War, to draw on "the only other source, Lake Michigan via the Chicago Sanitary and Ship Canal and the Illinois Waterway," to obtain the required 9 feet of draft. After this increase in diversion had been in effect for two days, a general rain fell over the upper Mississippi River basin and immediately relieved the situation.

The increased diversion, in effect on each of the three occasions mentioned, was offset by reduced diversions later, to bring the annual average diversion within the authorized limits, at the times. These instances are cited to illustrate how difficult it is to disassociate the 1,500 cfs diversion, authorized to the Sanitary District (actually the amount of water needed for navigation in the Chicago River, as a part of the Port of Chicago), from the water needed for navigation in the Illinois and Mississippi Rivers.

The additional construction cost to the Government, of the canalized project in the lower Illinois River and in the Mississippi from Grafton to St. Louis, over the original open river project, and presumed to exclude the need for more diversion from Lake Michigan, is substantially as follows:

Peoria and LaGrange locks and dams	\$ 6,125,000
Alton lock and dam	13,100,000
Chain-of-Rocks lock, dam, canal	34,000,000
Total to date	\$53,225,000
Future, after 1956, to correct low water condition, Chain-of-Rocks	5,802,000
Total	\$59,027,000

In October, 1956, because of prolonged drought in the areas tributary to the Missouri and upper Mississippi Rivers, the waters in the retention reservoirs of these two streams became substantially exhausted. Water depth at the Alton lock decreased to a point well below the 9-foot navigation depth. Navigation operations were severely hampered. The Sanitary District increased its flow by 1,900 cfs for ten days, beginning October 23, 1956. This was all that was possible, if the diversion was to be held within the 1,500 cfs limit for 1956. It may have raised the water level at the Alton lock about 2 inches. The Governor of Illinois, October 16, 1956, petitioned the Secretary of Defense for increased diversion of Great Lakes waters, to relieve the critical emergency. The Army Engineers planned to draw down the water in the Mississippi River navigation pools to 8-foot navigable depth, to provide more depth at the Alton lock. It seems preposterous that it should be necessary to use such last-resort measures to keep a critical section of the Inland Waterway in service. It would appear to be good engineering and sound common sense to provide against such an emergency by temporarily diverting sufficient lake water to maintain proper navigation depths for the brief period of such a crisis. This has happened twice in the past twelve years. This is not the concern of the Sanitary District, although the channels of the District are available for the needed increased flow.

#### Legislation

The Jonas bill, passed by Congress in 1954 and vetoed by the President; and the O'Brien bill, passed by Congress, House 1955, vote 316-74, Senate 1956, vote 43-33 and vetoed by the President, both provided for a temporary additional diversion of 1,000 cfs, for three years, and a study under the supervision and direction of the Secretary of the Army of its effect on lake levels and on the Illinois Waterway. This would merely be the completion of the study, required in the River and Harbor Act of July 3, 1930, of the amount of water needed to develop a commercially useful waterway in the Illinois River. It is a matter of unfinished business.

In his veto of the Jonas bill, 1954, the President stated that "existing diversions were adequate for navigation on the Illinois Waterway and Mississippi River." Such a statement was omitted from the veto of the O'Brien bill, 1956. The low water at the Alton lock and dam, in the Mississippi, in October, 1956, disproves the 1954 statement that existing diversions are adequate.

#### Summary

The Illinois Waterway is an artery of commerce of great and steadily increasing importance to the nation. It connects the two most important waterway



systems in the United States, namely; the Great Lakes and the Mississippi River. The commercial importance of this waterway has been recognized by Congress, which has approved the project for widening the Main Drainage Canal from Joliet to Sag and the Calumet-Sag Channel to extend this waterway to the important Calumet industrial region.

Industry is developing rapidly, along the Drainage Canal between Chicago and Joliet and along the Calumet-Sag Channel.

It would benefit the welfare of the users of this waterway, both on boats and on shore, to have at all times a clean stream on and about which to operate. Industry and industrial workers would be benefitted by having clean water for plant uses.

Despite the fact that The Metropolitan Sanitary District of Greater Chicago is now and for some time past has been providing complete treatment for substantially all of its sewage (to the extent of reducing its putrescence by 90 per cent as an annual average) the upper 50 to 60 miles of the Illinois Waterway is foul and, at times, extremely offensive. This is particularly the case in respect to the residents and workers along the Brandon Road pool in Joliet, Illinois. No sanitary project in the entire world equals the sewage treatment in the Metropolitan Sanitary District of Greater Chicago, or approaches it in volume.

The waterway is foul because, even with the highest degree of sewage treatment practicable, it receives each day a considerable tonnage of suspended sewage solids in approximately 1,150 MGD (1,720 cfs) of treated sewage, having a biochemical oxygen demand in excess of that which can be satisfied by the water presently diverted. The water authorized for navigation and now available in the canals, and the aerated treated sewage, can provide only about 75 per cent of the dissolved oxygen needed to supply the oxygen demand and to stabilize the solids remaining after complete sewage treatment. Since the flow is through quietly moving streams there is not much aeration of the water and little oxygen is absorbed from the air. The digesting of sludge previously settled in the canals and the pools of the waterway, at times, increases the oxygen demand.

Bathing and fishing in the upper reaches of this waterway are impossible and boating is quite limited.

No marked improvement can ever be expected with the present quantity of fresh water available.

Taxpayers of the Sanitary District, in paying for improvements in the Chicago and Calumet Rivers

and for the construction of the Main Drainage Canal and the Calumet-Sag Channels, the most important links in the Lakes to Gulf Waterway, have directly contributed \$82,000,000 toward this Federal waterway. These improvements still have local value for the run-off of flood waters, but any direct value for the disposal of sewage by dilution is nil. The State of Illinois has contributed \$20,000,000 toward the construction of the present waterway, between Lockport and Utica.

The need of water for the waterway between Lockport and Grafton was not considered by the Supreme Court, in the Lake States case. This case, between states, was limited to the Great Lakes and to ports on the lakes. The Supreme Court decision of 1929, 278 U.S. 367, held that the authority of the Secretary of War was limited to authorization of a diversion for the purpose of maintaining navigation in the Chicago River.

The study of the amount of water needed to develop a commercially useful waterway in the Illinois River, required in the River and Harbor Act of July 3, 1930, and made 1933 (House Doc. 184, - 73rd Congress, 2nd Session), should now be completed and the indirect needs, in the matter of securing satisfactory sanitary conditions for those aboard vessels or employed at terminals, should now be determined.

The effect of an increased diversion of 1,000 cfs on lake levels would be a lowering of not more than 5/8 inch. While this would be a benefit to riparian owners in the present time of high water levels, it would reduce navigation depths. Since every inch of draft is of considerable monetary value to navigation, it would seem reasonable that prompt action should be taken to correct some of the wide fluctuations in lake levels, which are measured in feet, not inches.

Canada cannot reasonably object to a diversion of as small an amount as 1,000 cfs, from Lake Michigan, which is not a boundary water. A tacit agreement at the time of the 1909 Boundary Waters Treaty made certain reservation for diversion from Lake Michigan and the 1950 Treaty specifically exempted the use of this water for "domestic and sanitary purposes and the service of canals for the purposes of navigation," as provided in H. R. 3210.

The welfare of more than 5,000,000 citizens in the Chicago area deserves consideration as do the needs for an adequate navigable water connection between Lake Michigan and the Gulf of Mexico.



## LAKE ERIE WATERSHED CONSERVATION FOUNDATION: PROPOSALS FOR USE OF LAKE ERIE WATER

by John H. Byrne, Executive Director

The outline prepared for possible water supply lines from the Great Lakes for the Lake Erie Watershed in Ohio is no idle dream. It is an indelible sign of things to come. Local and ground water resources are not large enough for future needs. This territory is rapidly developing into two sections: "Haves" and "Have Nots".

Communities piped into Lake Erie have assurance of future progress. The proverbial millstone hangs around the necks of communities dependent on limited and vanishing local water supply in the hinterland of the watershed. "That shall not happen", is the hopeful promise of the Lake Erie Watershed Conservation Foundation to the hinterland in the 13,500 square miles from Conneaut, Ohio, westward 250 miles, to Fort Wayne, Indiana.

There will be romance in the extension to the water pipe lines into the territory of the once productive oil wells in northwestern Ohio and northeastern Indiana. Oil now transported by pipe line from the huge fields of the Southwest will meet water by pipe lines from the vast resources of the Great Lakes. The critical material for future development in oil refining and electronics will be water. This territory with pipe lines will have assurance of adequate water.

Huge growth of population and industry must be anticipated. The Great Lakes area must be viewed as encouraging the greatest civilization has ever known, basically because of the oldest reason of all. We have the world's largest "waterhole". On this idea rides possibilities of regional co-operation, water distribution, planning and development as never before attained.

Throughout all history people and animals have sought the "waterhole" in their struggle for life. In sections of the North American continent individuals, communities and industrial organizations are hunting for water to survive. The International Great Lakes Watershed is a land of liquid gold and capable of supplying the needs of a huge population, many times its present numbers.

The Lake Erie Watershed Conservation Foundation is a non-profit Ohio Corporation organized a few years ago to promote regional planning and conservation of natural resources within tributaries of the Great Lakes that touch Lake Erie in Ohio. The basic program is to promote, through established governmental agencies, an unlimited and unfailing water supply by means of pipe lines from Lake Erie for home, farm, factory, and recreation usage. The

distribution of water surpasses the importance of our great, much desired and needed telephone, electric power and gas utilities.

The first step has been taken. The Foundation has financed a preliminary survey of eight counties in Northeastern Ohio. Included are Cuyahoga, Lorain, Summit, Portage, Lake, Ashtabula, Geauga and Medina. The area contains nearly 40% of Ohio's population and less than 10% of the territory. Among the cities are Cleveland, Akron, Lorain, Elyria, Painesville, Ashtabula, Kent, Ravenna and Medina. With the "know how" acquired there, the program will be extended into the 13,500 mile drainage region that is linked with the Great Lakes Basin.

Nature pays no attention to political boundaries. The drainage area of the Lake Erie watershed in Ohio extends into Michigan, Indiana and Pennsylvania. Water can be piped into all of these sections from Ohio under the terms of our international treaty. Such diversions flow back into the Great Lakes Basin. The laws of Nature and government are observed.

The Corps of Engineers, U. S. Army, record an average daily flow of 130 billion gallons through Lake Erie to Niagara Falls. The American Waterworks Association is authority for the figure of 140 gallons per capita used daily in the territory served by public and private water utilities in the nation. The interpretation of this information reveals a tremendous potential for this region. If distribution were possible, this average daily flow could supply the water needs of nearly half the world's population every day.

The foundation proposes distribution systems for a population presently of five millions and increasing to ten millions probably within a generation. Water available from Lake Erie for this 5 to 10 million population is big enough to supply nearly one billion human beings every day of their lives.

The Stanley Engineering Company of Muscatine, Iowa and Chicago is seeking to find, in a preliminary survey, the following information: What is the daily use of water in this eight county territory? From what sources is it obtained--from Lake Erie or local surface and ground sources? What is the reserve of local resources over present needs? When will future demand exceed local resources? How will supply be obtained from Lake Erie? Finally, what will be the cost of pumping treated and untreated water for distribution in the hinterlands of this eight county area?

The final results of the survey will not be announced

until late 1956 or early 1957. The Foundation is confident that the survey will confirm the need of regional planning for water and sewage systems based on the following facts.

1. The potential growth of this area depends upon water from Lake Erie and its availability for distribution.
2. The distribution of water can be initiated and maintained at a cost that the hinterlands can afford to pay for survival and competitive development with communities close to the lake shore. (Engineering problems are not insurmountable. Compared with California's plans, our engineering should not be difficult.)
3. Planning must be undertaken soon!

This great blessing of water must be maintained by strict observance of the International Treaty between United States and Canada for the protection of all users--home, farm, factory recreation, transportation, fisheries and electric power generations. However, we are faced with the responsibility of keeping the provisions of our treaties in tune with regional and industrial development of the present and future. That shall never be a easy task and shall always require eternal vigilance. A guide to that undertaking could be the words of wisdom from a great American, Justice Oliver Wendell Holmes: "Times change and with them customs".

What will be the needs of a large expanding industrial economy as contrasted with agricultural communities? Unfortunate situations are appearing in this region today. The cause is industrial expansion in conflict with laws enacted when the country was either wilderness or dominantly rural. Laws relating to water are certain to receive state, interstate and international attention in the coming years.

A sign of hope appeared on the horizon at the second annual Ontario Water Resource Conference in London, Ontario, November 1, 1956. In the program under the subject "Water Resources and Regional Planning" was this statement: "Two great countries share the Great Lakes-St. Lawrence drainage area in friendly co-operation. However, many political boundary lines (National, provincial and state, county, township, city and town) cut across and complicate the natural courses which water follows. This session will bring about a discussion of the many water resources problems involved in regional planning".

Citizens of the United States participated in the discussion with their good Canadian neighbors. The Foundation shares in the pride of Ontario citizens in the formation of their Ontario Water Resources Commission by their Legislature in 1956. This legislation follows the general principle of that which our survey is intended to promote for the Lake Erie Watershed in Northern Ohio. The exceptions may be regional governmental authority in-

stead of state or provincial as enacted in the Ontario law.

Friendly relations prevail between this Foundation, the Ontario Water Resources Commission and the Southwestern Ontario Water Resources Committee. In November 1954, this Foundation sponsored a water conference at Elyria, Ohio to present the potential of an integrated system of water distribution linking local resources with the huge Great Lakes supply. Elyria was chosen because it was the first inland city of Ohio to construct a water supply line to Lake Erie. This was in 1903.

Two citizens from Ontario, Mr. A. M. Snider, businessman of Waterloo and Dr. A. E. Berry, Ontario Department of Health, were inspired to action by the information presented by foremost water authorities. Their leadership, supported by the Premier of Ontario, Honorable Mr. Frost, and the Southwestern Water Resources Committee, is accredited with establishing the commission. Mr. Snider, is chairman and the general manager is Dr. Berry, a continental water authority and former President of the American Water Association. He has many friends in the United States.

The studies of the Ontario Commission, Southwestern Ontario Committee and this Foundation will be exchanged with the hope of encouraging progress and promoting international amity. This Foundation will share its information with all of these states and provinces in the Great Lakes region.

May that day soon come when the Great Lakes Commission is a strong and functional international organization in the two nations and directed to nurturing a great civilization by guarding its resources indispensable for life. Membership in this commission by dedicated citizens of the states and provinces should take the highest rank among patriotic services that citizens can render to their country.

The lessons of history should impel us to noble citizenship. When the water resources of other civilizations vanished, the people perished or became slaves of a conqueror. Today, in a period of terrifying global conflict, two strong and free nations still have a choice!

## GREAT LAKES OVERSEAS FREIGHT CONFERENCES: GREAT LAKES OVERSEAS TRANSPORTATION DEVELOPMENT

by George H. Weiss, Chairman

The present flourishing Great Lakes-overseas transportation industry is a child of the 1930-1933 economic depression. Right smack in the middle of that depression - on July 26, 1931, to be exact - a rusty steamer poked its nose up the Chicago River. It flew the Swedish flag and was named Anna and it was an epoch making voyage bringing a full cargo of barbed wire, chicken wire and other steel products from Antwerp and all for delivery to Montgomery Ward & Company.

Everyone knows that hundreds and hundreds of vessels from all parts of the world sail into the Port of Montreal. Also hundreds and hundreds of vessels sail from the Port of Montreal into the Great Lakes. Few people gave thought to the possibility of vessels moving from the European Continent past the Port of Montreal and through the restricted canal and lock system of the Upper St. Lawrence and then through the Great Lakes direct to the Port of Chicago.

The depression brought need for economizing in transportation costs and the ever venturesome Maxim M. Cohen, now executive director of the Chicago Regional Port District, developed the arrangements for the voyage of the Swedish steamer Anna in 1931. Other vessels followed with cargoes direct from Europe and finally in 1933 the first regular steamship line of modern times was established between the Great Lakes and Europe.

In this pioneering development Harry Brockel of the Port of Milwaukee also made an important contribution in cargo promotional activities in the highly industrialized Milwaukee region and in the agitation at Washington against rules of the Atlantic Coast steamship lines directed, under their contract rate system, towards prohibiting shippers from utilizing Great Lakes-overseas steamship services.

These adventuring Great Lakes-overseas steamship lines supplied the positive truth that the St. Lawrence Seaway route was not merely an idealistic vision but rather that it was a completely practical avenue of transportation between the central west and the markets of the world on the Seven Seas. It was the operation of these Great Lakes-overseas steamship lines that removed doubt in Congress concerning the St. Lawrence Seaway and which brought sufficient congressional votes to the Seaway project that enabled passage of the legislation through which, in 1959, the United States and Canada will have a Seaway route that will add billions upon billions to their midwestern economy.

Great Lakes-overseas steamship operation has

grown from the single venturesome line that began service in 1933 to a current total of 25 lines operating in the 1956 navigation season.

There are five Great Lakes-United Kingdom services, nine Great Lakes-Bordeaux-Hamburg Range operators, four Great Lakes-Scandinavian and Baltic Lines, four Great Lakes-Mediterranean services and one line operating between Great Lakes and South America.

We figure that the season now coming into its final weeks will have witnessed a total of 325 regular line sailings out of the Great Lakes, plus approximately 50 tramp vessel sailings. This compares with 255 regular line and 34 tramp sailings during the 1955 season.

Each year since 1931 has shown an interesting increase in the volume of freight moving in Great Lakes-overseas services. Export and import freight handled by the Great Lakes-overseas lines in 1955 totaled 535,000 tons with indications that when the 1956 statistics become available they will show a healthy increase.

The big question of the day is how much general freight cargo will result when the St. Lawrence Seaway is opened in 1959 and vessels with larger freight carrying capacity can be operated in Great Lakes-overseas commerce.

Unless railroads and highway carriers provide export and import freight rates the extent of Great Lakes-overseas cargo transportation expansion will be importantly frustrated. A year ago railroad and highway carrier reaction to the need for Great Lakes export and import freight rates was negligible, but fortunately in the last year there has been a steady increase of interest by these inland carriers in the freight development opportunities that will be generated by the Seaway.

One important item that Great Lakes-overseas commerce in all of its phases urgently requires is the establishment of a unified Great Lakes-Seaway Protective and Promotional Agency. I don't know whether it is properly within the sphere of the Great Lakes Commission to undertake such urgently needed activity. However, this is a topic which I would like to discuss in greater detail at a later date.

The American economy is now on a gross national product peak of \$416 billion. It stood at \$399 billion for 1955. Leading government and private economists freely declare that the gross national product will reach \$650 billion some time between 1975 and 1980. The American transportation plant is today handling

record breaking volumes of freight on the rails, on the highways and on the waterways. It will be the Great Lakes-Seaway that will contribute to the American transport plant, both domestically and for international commerce, the accommodation for the increased freight shipments that will enable the American economy hitting the \$650 billion mark as forecast. The importance of the St. Lawrence Seaway is today still but a dancing gleam in the eyes of Seaway proponents. A decade hence the Seaway's contribution to American and Canadian affairs will be regarded as indispensable.

The word "conference" as used in connection with a group of steamship lines operating in a given international trade route stems from a practice begun as far back as 1875 when steamship lines regularly operating in a given trade met at intervals to confer on what steps may be required to meet the competition of "in and out" competitors whose rate cutting practices disturbed stability in the trade and provoked conditions harmful both to the shippers of freight as well as to the owners and operators of the regular line services.

By various restrictive and protective devices these old time steamship conferences sought to protect the interests of their shipper clients and also themselves through rate practices generally regarded as fully acceptable by the principal maritime nations of Europe.

The outbreak of World War I in August 1914 brought with it a complete collapse of the international trade of the United States due entirely to the fact that only a negligible measure of the international commerce of the United States was carried by American flag vessels.

Congress, immediately following outbreak of World War I, authorized formation of a shipping investigating committee, since known as the Alexander Committee. It was charged with determining essentials vital to creation of an American Merchant Marine so that external wars would not put a blight on the commerce of the nation.

The Alexander Committee which carried on its investigation for two full years quickly ran against the existence abroad of numerous steamship conferences. Testimony taken by the Committee both commended and criticized the practice of these European steamship conferences particularly the use of what is known as the Deferred Rebate System.

However, in its report to Congress the Alexander Committee recommended adoption of the steamship conference system as being the only known and desirable method for fostering development of an American Merchant Marine through affording protection to the regular steamship lines against competitive rate cutting invasion of their trade when cargo movement was good and the prompt withdrawal of this competition as soon as cargo movement declined.

The Alexander Committee Report and recommendations were vigorously debated in Congress. There

followed enactment of the Shipping Act of 1916, which called for establishing American flag lines in the leading cargo trades but also protects the interest of the American international trader through requiring steamship conference groups formed under the 1916 Shipping Act to submit to government approval before functioning and to submit to intensive government regulations thereafter. Thus since 1916 when a group of steamship lines operating, for example, between the North Atlantic ports and the East Coast of South America wished to organize a steamship conference, whether such steamship conference was to include American flag service or not, they filed application with the Shipping Board at Washington and wherein they detailed the character of associated activity in which they would engage. If the conditions laid down in this application were determined by the Shipping Board to be not detrimental to American commerce, approval was given to formation of the conference and such Shipping Board approval carried with it exemption from the anti-trust provisions of the Sherman Act and related legislation.

According to the latest compilation, there are in existence at this time approximately 135 steamship conferences embracing lines whose vessels operate into and out of American ports in the foreign trades.

On the Great Lakes there are seven steamship conferences now functioning, as follows:

- Great Lakes-Bordeaux-Hamburg Range East-bound Conference
- Great Lakes-Bordeaux-Hamburg Range West-bound Conference
- Great Lakes-United Kingdom Eastbound Conference
- Great Lakes-United Kingdom Westbound Conference
- Great Lakes-Scandinavian and Baltic Eastbound Conference
- American-Great Lakes-Mediterranean East-bound Conference
- American-Great Lakes-Mediterranean West-bound Conference

Through the availability of these steamship conferences American international commerce benefits along the following well defined lines.

(1) A stabilized uniform rate structure is maintained so that international traders can make forward shipment purchases without fear of an overnight sharp decrease or increase in the freight rates. Where the steamship conferences utilize what is known as the dual-rate system involving exclusive patronage agreements with freight shippers such systems incorporate a clause giving the shipper the benefit of any freight rate decrease and at the same time protects them against any freight rate increase that would be applicable to shippers not signing exclusive patronage agreements. One can well imagine the chaos that

would prevail if the railroad freight rate between Chicago and Denver were to change from day to day or if each railroad between Chicago and Denver maintained its own individual tariffs of rates importantly differing from rates of their competitors. The uniform rate structure in American transportation underlies the soundness of our domestic economy.

(2) Spacing of sailings by the various steamship lines comprising a steamship conference is still another important advantage yielded by the conference system. Thus if a given trade route could be adequately served by one sailing a week the several conference lines would normally stagger their sailings so that such frequency would be provided rather than each member offering a sailing in a single week with no sailings over the balance of the month. Where a trade is exceedingly active the lines comprising a conference arrange one, two, three or even more sailings each week. The grouping of three to as many as twenty fleets of vessels in a single conference enables providing the American shipper with sailing frequency ample to meet the needs of the exporter and/or importer.

(3) Under the conference system all member lines are regular line operators dispatching their vessels from loading ports on designated sailing days, full or not full. This regularity of vessel discharge plus excellent sailing frequency has made an important contribution to the high and strong position of American international traders in the world markets.

Each steamship conference must function strictly within the framework of its approved agreement. If a conference desires to amend or expand its approved agreement, such amendment or expansion must be filed and approval obtained before its provisions are applied. This is the strict and continuing regulation presently exercised over steamship conference agreements by the Federal Maritime Board.

The freight rates set up by the steamship conference must also be filed with the Federal Maritime Board, but such filing is required not more than thirty days after being made effective. This delayed filing privilege is vitally essential towards keeping American exporters and importers in a day-to-day and hour-to-hour competitive position with world traders in other exporting and importing nations. If the off-shore steamship lines could not make freight rate changes effective until 30 days after filing notice with the Federal Maritime Board it would be inescapable that American international commerce would suffer.

The steamship conference system yields benefits not only to the shippers who supply the freight but also to the steamship lines that are members of the conference, particularly where the so-called dual-rate system is utilized. Under the dual-rate system a shipper agrees, in exchange for a discount from the regular ocean freight rate, to give all of his freight shipments for a specified period to a

steamship conference group. Such exclusive patronage arrangements in turn give a measure of assurance to the steamship lines of the volume of cargo they are likely to obtain as a minimum for each sailing over the life of the exclusive patronage agreement. It enables the steamship lines to set up specific firm sailing arrangements six or more months in advance and, in turn, gives to the world trader immediate definite knowledge of scheduled sailings that will cover his export sales or import purchase commitments along with an assured stable rate.

The ocean freight shipper who feels that it is more advantageous to have the privilege of utilizing reduced freight rates offered by non-conference competitors still has available a reasonable freight rate from the conference lines and also gets the benefits of frequency and assurance of conference sailings.

In the realm of ocean transportation one must constantly bear in mind that a ship is an inflexible object. A freight train departing this afternoon from Chicago to Denver can be enlarged or reduced to the exact number of loaded cars to be moved. A 10,000 ton capacity ocean general cargo carrier can never be anything but a 10,000 ton carrier. If cargo space demand is in excess of vessel capacity it still cannot carry more than 10,000 tons. If cargo space demand is slow the space unoccupied by freight represents a dead loss to the line for the simple reason that on the succeeding voyages the vessel continues to be limited to 10,000 tons capacity and, therefore, cannot make up the deficiency of freight on the less than capacity sailings.

No export or import shipper can ever get conference freight rates made exclusively for them. The shipper of a single ton of freight gets exactly the same rate as the shipper of 1,000 tons of the same product.

All these advantages and benefits have justified the American world traders in giving to steamship conference groups fully in excess of 75 per cent of the total American commerce moved by regular line general cargo vessels.

Here are a few endorsements of the steamship conference principle voiced by highest officials of the Federal Maritime Board, which is the government agency charged with the duty of protecting the well-being of American commerce.

Mr. Clarence G. Morse, Chairman of the Federal Maritime Board, addressing the Propeller Club of San Francisco on May 20, 1955, made the following statements:

"Shipping lines are able to earn a fair profit plus depreciation . . . only where they can be operated in a climate of freight rates stabilized and maintained at a level which provides maximum opportunity . . .

"The Federal Maritime Board can, and will, exercise its statutory powers and its influence to obtain that climate in our foreign trade.

" . . . it is the policy of the Board to continue to strengthen the conference system in our foreign trade.

"Under our conference system we see democracy in action.

"While not perfect the conference system is the best method yet devised to protect the public and the carriers.

"Long overdue is the authority of the Federal Maritime Board to curb irresponsible competitive practices . . . which in the long run bring down disaster on all, whether such practices are pursued by American-flag carriers."

More recently, on October 11, 1956, Mr. Thomas E. Stakem, Jr., a member of the Federal Maritime Board, in addressing the annual Merchant Marine Conference at New York had this to say with regard to the steamship conferences:

"The problem of rate stability is before us. It cannot be ducked or side-stepped. At the moment there is a booming freight market due to many factors -- The European need for foodstuffs, the great demand for American coal, stockpiling operations here, and threatening international crises of which we are aware. But the roots of potential rate wars remain.

"The conference system which was legalized by Congress by Section 15 of the Shipping Act, 1916, was supposed to assure the American exporter and importer and the shipowners who serve our commerce this needed rate stability. And indeed it has done so over the years. But to be successful the conference system must attract the major carriers serving a particular trade. To do

so conferences must have some means to attract; it must be to the economic advantage of lines to join.

"The contract rate system has supplied this economic advantage. The board has said in various cases that the contract rate system is not unlawful per se and has recognized its use where needed to achieve stability. Some of the Board's basic decisions are now under review before the Courts. Regardless of the outcome of the court cases, one thing is certain -- means to achieve stability must be found as the mere threat of recurring rate wars with all enveloping losses has not heretofore proven to be sufficient to insure stability."

Any reputable steamship line may join a steamship conference. A conference is not an exclusive club. In fact, under our law, denial of membership in a conference without just cause will immediately bring a warning from the Federal Maritime Board that such continued denial will be visited with cancellation of the Federal Maritime Board approval of the conference agreement. I trust that the foregoing gives the layman a reasonably good working knowledge of the basis for existence of steamship conferences in our international trades.

In the Great Lakes-overseas steamship activities the principle of steamship conferences is well adopted. Naturally in a steamship trade that is still in an evolutionary stage, such as Great Lakes-overseas commerce, the extent of non-conference competition has been limited but at times definitely disturbing to rate stability. As yet the Great Lakes-overseas lines have not adopted the dual rate and exclusive patronage system but steps in that direction can be regarded as certain.

## GREAT LAKES RESEARCH INSTITUTE: ORGANIZATION, OBJECTIVES AND PROGRAM

by David C. Chandler, Chairman  
Council of the Institute, University of Michigan

### Organization and Objectives

The Great Lakes Research Institute is an organization within the Horace H. Rackham School of graduate Studies of the University of Michigan. It was established by action of the Board of Regents on May 16, 1945, for the "encouragement and integration of studies of the physical, chemical, biological, and other aspects of the Great Lakes and related areas."

It is a research organization in the broadest sense, whose objectives are the stimulation, promotion and coordination of research on the Great Lakes, as well as to implement the University's teaching and research program for graduate students. The Institute's objectives may be more specifically stated as follows:

1. To contribute by every means at its disposal to increase understanding of all aspects of the Great Lakes region.
2. To cooperate with other organizations on the campus, within the state, and outside the state in the conduct of mutually beneficial research on the Great Lakes and their tributary waters.
3. To make available the results of Great Lakes investigations, and to make special efforts to place them in the hands of those concerned with practical operations.
4. To serve, in general, as a center for Great Lakes information and research for the University, the state and the entire Great Lakes region.
5. To implement the teaching and research program of the University of Michigan.

Basic, applied and contract research will be conducted under the control of the Council of the Institute in accordance with the following policies:

1. There shall be a continuity of basic research conducted under the direction of the permanent scientific staff of the Institute.
2. All research, whether basic or applied, shall contribute at least in part to the training and teaching functions of the Institute.
3. Contract research shall be done provided:
  - a) The contracted studies contribute basic

knowledge to a better understanding of these lakes even though the specific aim of the contract may be directed toward the solution of a practical problem.

b) The wording of the contract is such as to permit the Council to sub-contract, if it desires, to existing campus organizations.

### Research Program

The Great Lakes represent a natural resource of increasing importance and value to areas and communities bordering on them. The role of these lakes in the national economy is expressed primarily through shipping, hydroelectric power, water supply sanitation, recreation and biological resources. It is difficult to determine how wisely this natural resource is being used since so little is known about the lakes themselves. It is certain, however, that man through his use of these waters is causing marked changes. Unfortunately the nature and rate of these changes cannot be properly evaluated since there is no basic information available which may serve as a base line or reference point. The research program of the Great Lakes Research Institute is directed primarily at rectifying the astonishing lack of fundamental scientific knowledge about these lakes. Without this information it will be difficult, if not impossible, to solve the numerous economic and social problems of the Great Lakes states, so intimately associated with these large lakes (95,000 sq. mi.) and their 8000 miles of shoreline. Also, the completion of the St. Lawrence Seaway, with the consequent increase of commerce and industrialization, will intensify some of the present problems and will create new ones.

In establishing a long-term research program on the Great Lakes, it was the belief of the members of the Institute that the first step should be a study of currents. A basic knowledge of currents and patterns of water circulation in these lakes is believed to be prerequisite for the understanding and solution of problems related to water quality, water supply, waste disposal, navigation, wind and weather forecasting in the Lakes region, maintenance of harbors and channels, shore erosion, location of industry, air pollution, fisheries and biological productivity, and recreation.

During the summer of 1954, the Institute carried out its first major research program on the Great Lakes. The study was on Lake Huron for the purpose



of obtaining general information on temperature and chemical characteristics of the water, the rate and direction of currents and the general pattern of water circulation in the entire lake. This was accomplished through the use of the "Synoptic Survey Method", which consists of standardized observations and collections being made simultaneously at a large number of predetermined positions throughout the lake. This was done three times during the summer, June 25, July 27, and August 25, and each time approximately one hundred stations in the lake were sampled through the use of eleven fishing tugs. At each station water temperatures were measured from surface to bottom, samples of water were collected from several depths for chemical and biological analyses, drift bottles were released and the transparency of the water was measured. Except in the upper and lower ends of the lake, each vessel steered a V-shaped course. The courses were laid out on both sides of the lake so that from each pair of vessels an X-shaped pair of crossings were obtained. Not all vessels kept an exact course, but considering the size of the tugs, size of the lake (length 216 miles, width 183 miles) and rough seas, each cruise was highly successful. Results from each "synoptic cruise" were analyzed and plotted to furnish a bird's eye view of conditions existing in the entire lake on that particular day.

A report of the Lake Huron study has been published, **CURRENTS AND WATER MASSES OF LAKE HURON**, which is available from the Institute upon request. The discussion which follows deals only with general results pertaining to surface currents, although sub-surface currents and several other parameters are described in the published report.

To facilitate the description and understanding of water circulation in Lake Huron, four figures are included for reference. The first is an orientation chart giving the general features of the shoreline and the major cities. The other figures show the surface circulation pattern of the entire lake on each of the three days of study.

On June 25, 1954, the surface currents of the lake (Fig. 2) were characterized by a large counter-clockwise eddy in mid-lake east of Alpena, a smaller counter-clockwise eddy just off the mouth of Saginaw Bay, and an elongate clockwise eddy parallel to the Ontario shore between Point Clark and Cape Hurd. Lake Superior water which entered through Detour Channel, False Detour Channel, and Mississagi Strait, moved westward where it met and jointed the water entering from Lake Michigan through the Straits of Mackinac. Strong currents up to 0.5 mph carried the mixed waters southeastward to mid-lake east of Sturgeon Point. At this position a portion of the flow turned to the northeast, forming the large counter-clockwise eddy, and the other portion turned to the southwest, passing inshore of the eddy off Saginaw Bay.

This water returned to mid-lake just north of Pte. Aux Barques and turned southward to the outlet at Port Huron. Except for a small counter-clockwise eddy off Goderich, Ontario, the flow was southward in the lower portion of the lake.

The currents observed on June 25 probably represented the general pattern of circulation in Lake Huron during spring and early summer when the water was in the process of warming. During this period of warming the water temperatures were low, ranging from 40-60°F, and only the upper 50 feet was above 50°F. Since the temperature differential was small, the water mass was unstable and was more subject to influence of wind action. It is of interest to note that the current pattern observed on June 25, 1954, was similar to the "average" pattern deduced from drift bottle releases made during the shipping seasons of 1892-94 by M. W. Harrington of the U. S. Weather Bureau.

During the period between the first and second synoptic cruises, June 25 to July 27, the lake water had warmed considerably. On June 25 the water temperature at Station 46, near the center of the lake east of Alpena, was 43°F at the surface, 41°F at 50 feet, and uniformly 40°F from 100-600 feet. Temperature at the same station on July 27 was 61°F at the surface, 51°F at 50 feet and 41°F at 100 feet, but uniformly 40°F from 100-600 feet. This warming by July 27 had established a temperature differential between the upper 50 feet and the remaining depths so that mixing of the two layers would be unlikely because of density differences. In other words, the water below 50-100 feet was effectively cut off from the mixing action of the wind.

The differences between the surface current patterns in June (Fig. 2) and July (Fig. 3) are essentially the effects of wind direction. On June 25 the wind was from the west and on July 27 it was more northerly in direction. It might be assumed that the June pattern was more characteristic of summer conditions since the prevailing winds are westerly.

The pattern of surface currents on July 27 was characterized by a rapid flow southeast from the Strait of Mackinac to the region of Presque Isle, where they reached a velocity of 0.75 mph. This band of rapid flow extended south from Alpena to the region of Oscoda. In the northern part of the lake the currents were slower and moved eastward to about mid-lake and crossed to the shore of the Bruce Peninsula. Here the current velocities reached a maximum of 0.57 mph. Along the shores of Drummond and Manitoulin Islands the currents moved eastward in an irregular course to the entrance of Georgian Bay.

Outflow from Saginaw Bay in July seemed to involve the entire surface layer of the bay. It moved out in a northeast direction, turned southward around the tip of the "Thumb", and came



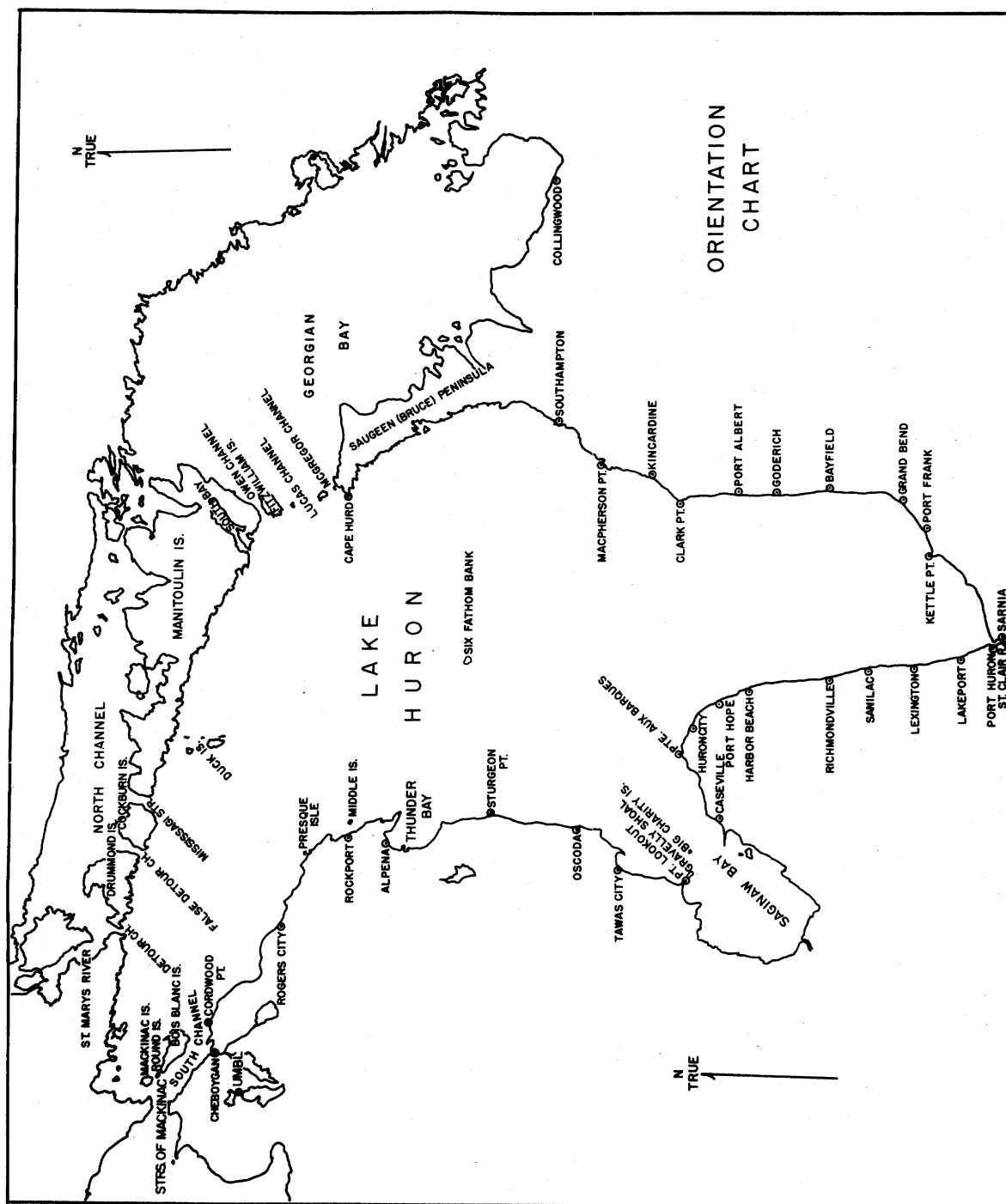


Figure 1

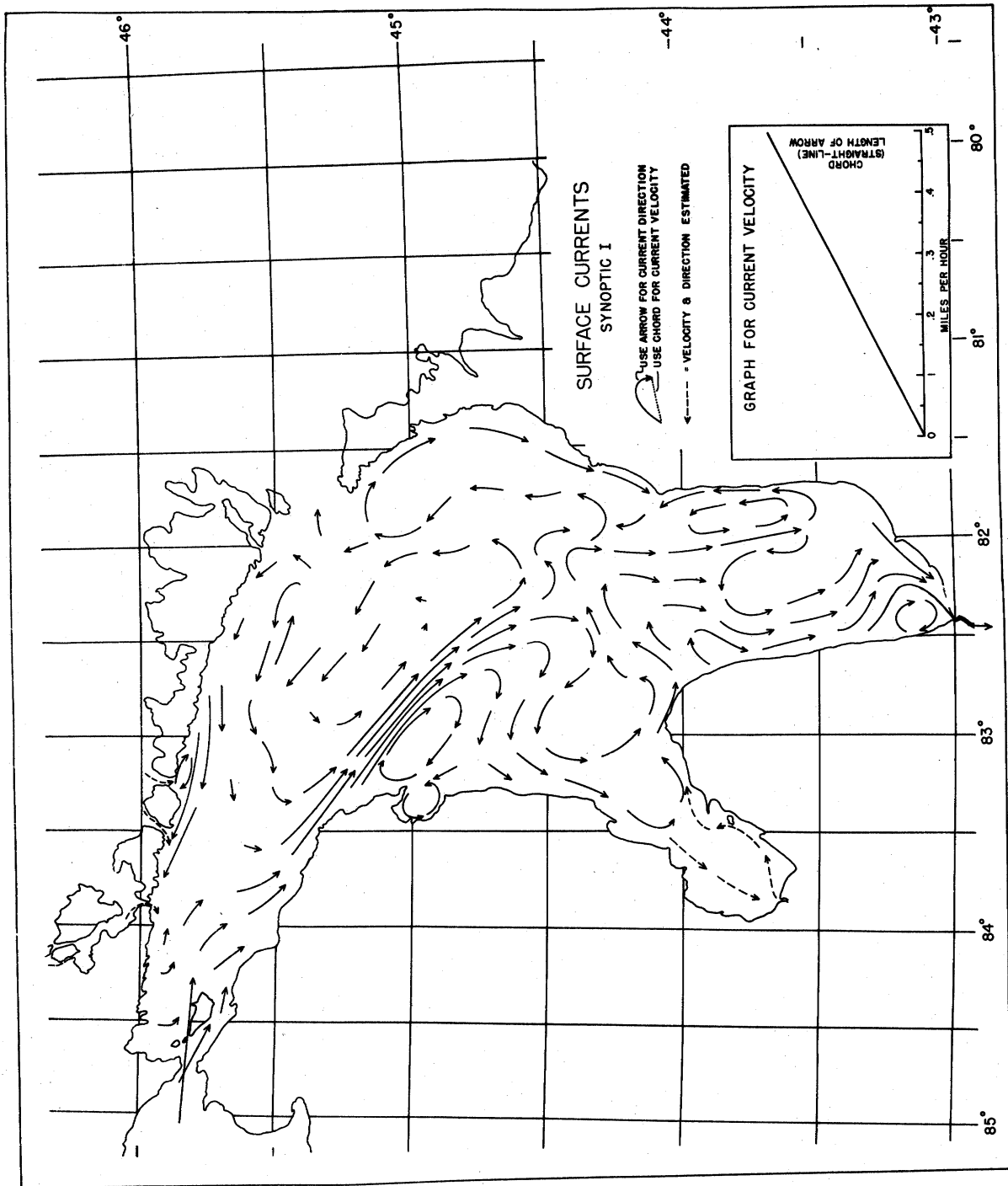


Figure 2

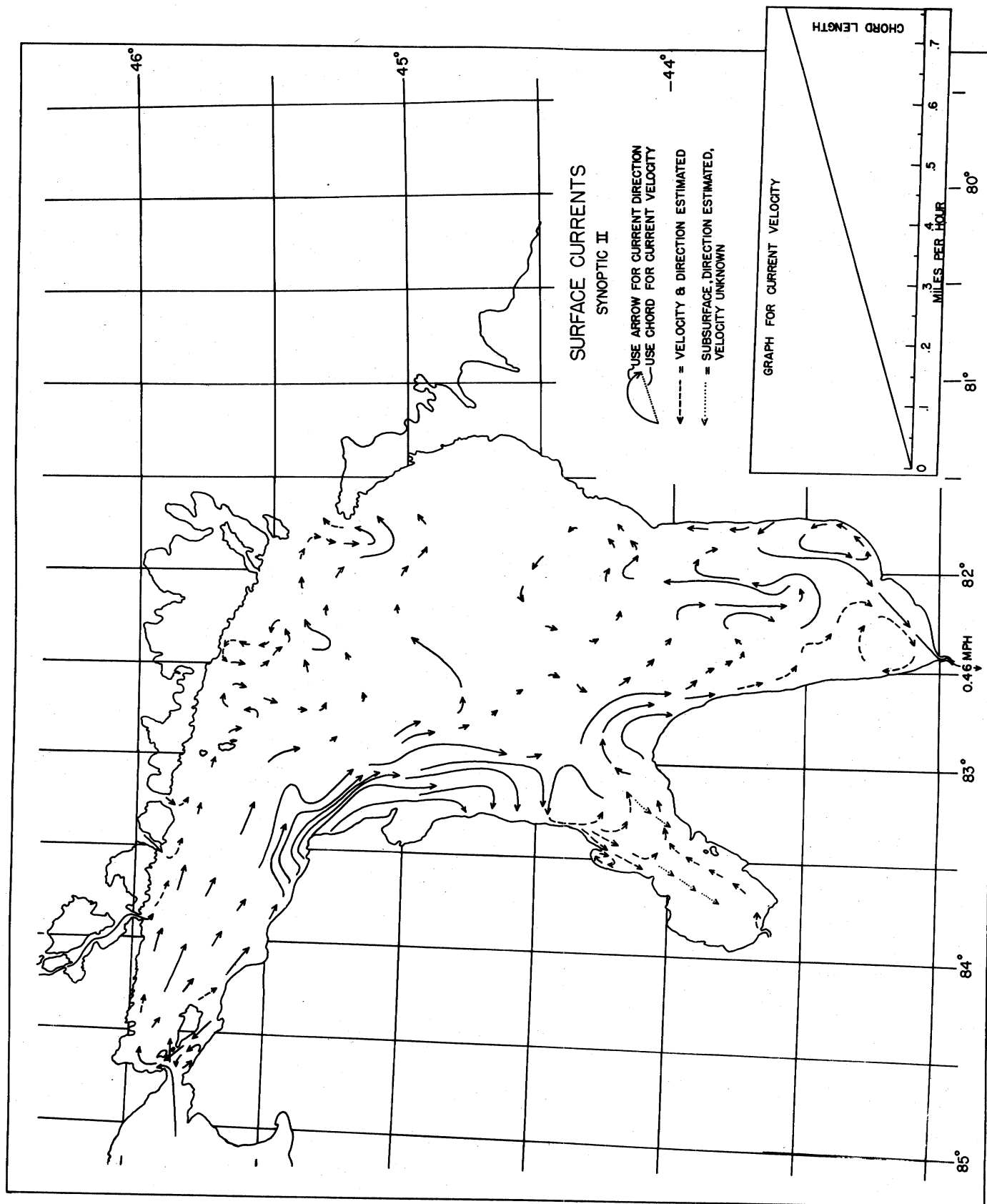


Figure 3

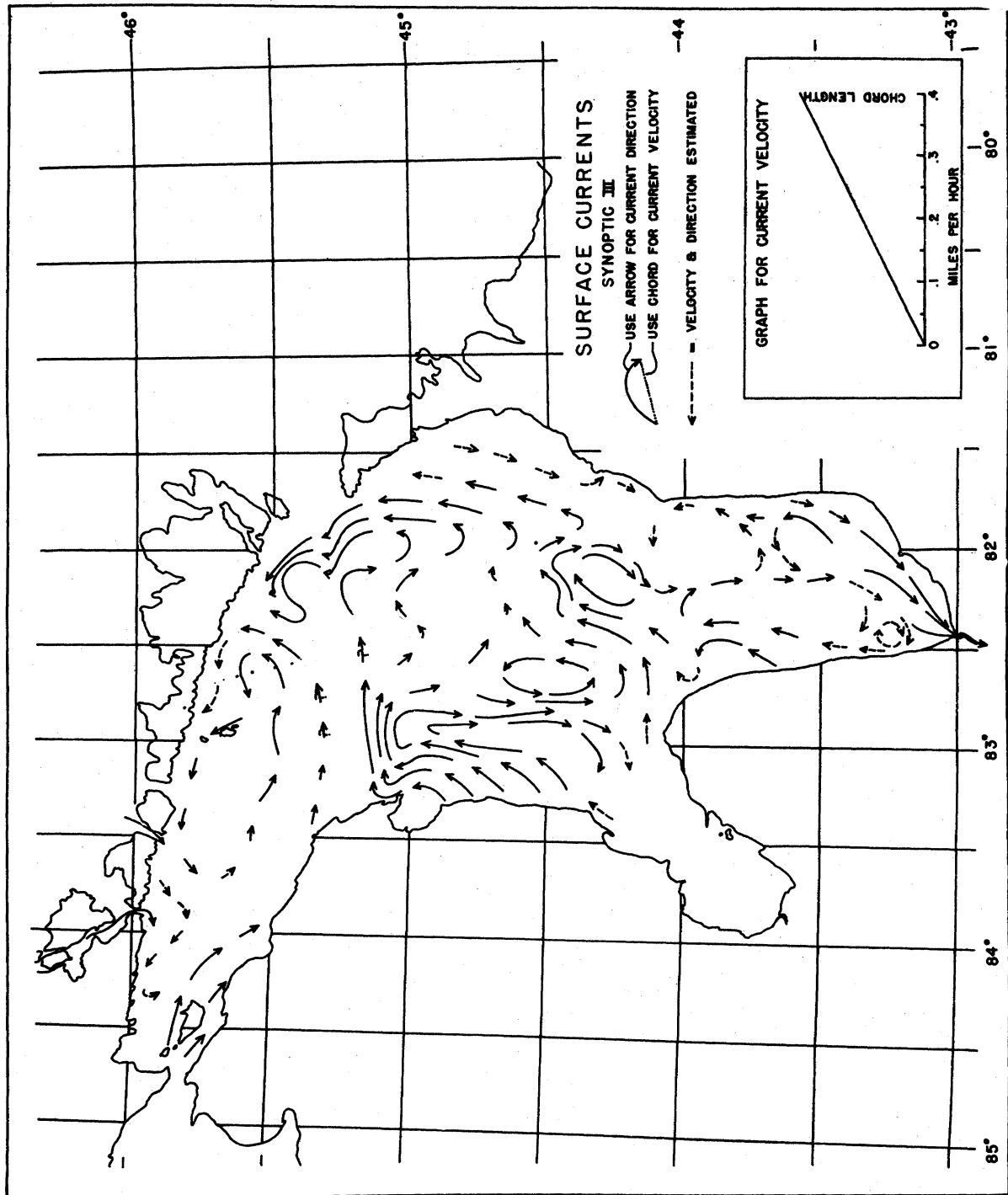


Figure 4

ashore between Port Hope and Port Sanilac, Michigan. Current velocities in this flow averaged 0.3 mph. This current turned off-shore and entered a mid-lake counter-clockwise loop in which velocities reached 0.5 mph. Currents in this loop moved toward shore in the region of Port Albert and then diverged, part going south and part north toward Clark Point.

On August 25, the time of the third synoptic cruise, the surface temperature at station 46 was 66°F, in contrast to 61°F at the time of the second cruise. However, temperatures at 50 feet and below were almost the same as on the previous cruise. It appears that the lake water had warmed nearly to its maximum by late July, except for the very surface water. Therefore the differences in current pattern between the second and third cruises may be ascribed to difference in wind direction.

At the time of the third cruise, August 27, winds were westerly and the current pattern (Fig. 4) resembled in many respects that observed on the first cruise (Fig. 2). A counter-clockwise eddy occupied the central part of the lake as it did in June, and the lesser eddies present in June were present in August, but they were less well defined. Lake Superior water moved westward where it joined and became mixed with the inflow from Lake Michigan and then flowed southeastward to the general region of Alpena. South and east of Alpena this current divided, one portion flowing across the lake and northward to form the large counter-clockwise eddy. The second portion, the larger of the two, passed southward along the Michigan shore and inshore of the eddy off the mouth of Saginaw Bay. This water entrained the outflow of Saginaw Bay, moved to mid-lake east of Pte. Aux Barques and then moved southward to the outlet.

A comparison of data from the three surveys shows distinct differences in the current patterns, but reveals the existence of a fundamental pattern having the general characteristics of the one described for June. Differences which exist among the three cruises are due primarily to differences in wind direction and water temperatures throughout the summer period.

In the summer of 1955 a similar program of synoptic studies was carried out on Lake Michigan. The purpose of the study was essentially the same as that for Lake Huron and the same methods and parameters were used. Because of the size and shape of Lake Michigan and the scarcity of boats available for charter, each vessel crossed the lake one day and returned on the same transect the next day. This provided synoptic data on two consecutive days, an

improvement over the Lake Huron synoptic design. The first pair of cruises were made on June 28 and 29, and the second pair on August 9 and 10. Eight transects were traversed on each synoptic cruise: 1) Straits of Mackinac, 2) Charlevoix to Manistique, 3) Frankfort to mouth of Green Bay, 4) Manistee to Sturgeon Bay, 5) Pentwater to Manitowoc, 6) Whitehall to Milwaukee, 7) South Haven to Waukegan, and 8) Michigan City to Waukegan.

The data from the Lake Michigan study are being analyzed, and a published report is scheduled for distribution in the fall of 1957. This report, like the one from Lake Huron, will be available upon request from the Institute.

In addition to the studies of currents in Lakes Huron and Michigan, the Great Lakes Research Institute has conducted a series of smaller investigations in northern Lake Huron and the Straits area during the summers of 1955 and 1956. They include the following studies: 1) Measurement of water transport in the Straits area, 2) Measurement of carbon fixation by phytoplankton through the use of  $C^{14}$ , 3) Distribution and abundance of bottom-dwelling organisms, and 4) Particle size and distribution of surface sediments in northern Lake Huron. The base of operations for this work is the University of Michigan Biological Station located near Cheboygan, Michigan. In these studies several students attending the Biological Station were employed as field assistants, thus integrating the Institute's research activities with the University's teaching program.

The research program for the summer of 1957 will be centered in northern Lake Huron and the Straits area; however, some work will be done on smaller bodies of water such as Grand Traverse Bay and Mullet Lake. Studies of the lake sediments will be continued along the same lines as in previous summers. Also, core samples of the lake bottom will be taken, in the Straits area, for the purpose of obtaining details related to the geological history of the Great Lakes. A study of the mineralogical and chemical nature of the core sediments will be made in relation to their freshwater environment of deposition. Further studies on the quantitative distribution of bottom-dwelling organisms will be made at stations selected for the depth of water and nature of sediment. Currents will continue to be investigated in the general area, but special studies will be directed at a correlation between the distribution of bottom sediments and pattern of water circulation.

